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The Perth Amboy Plant of the American Smelting and Refining Company.*

BY O. PUFAHL.

These works were erected in 1895 by the Guggenheim Smelting Co. They are situated on Raritan Bay, opposite the southern point of Staten Island, in a position offering excellent facilities for transportation by land and by water. The materials worked up are base lead bullion and crude copper, containing silver and gold, chiefly drawn from the company's smelteries in the United States and Mexico. Silver ore is received from South America. The ores and base metals from Mexico and South America are brought to Perth Amboy by the company's steamships (American Smelters Steamship Company).

Ore Smelting.—The silver ore from South America (containing antimony and much silver, together with galena, iron and copper pyrites) is crushed by rolls and is roasted down from 26% to 3% S in 11 reverberatory furnaces, 70 feet long and 15 feet wide (inside dimensions). It is then mixed with rich galena from Idaho, pyrites cinder, litharge, copper skimmings, and residues from the desilvering process, together with limestone, and is smelted for work-lead and lead-copper matte in three water-jacketed furnaces, using 12% coke, figured on the ore in the charge. Of these furnaces one has 12 tuyeres; it measures 42x96 inches in cross-section at the tuyeres, and 6 ft. 3 in. by 8 ft. at the charging level. The height of charge is 16 feet. The other two furnaces have 16 tuyeres each, their cross-section at the tuyeres being 44 in. by 128 in., at the charging level 6 ft. 6 in. by 12 ft., and height of charge 16 feet. The furnaces are operated at a blast pressure of 35 oz. per square inch. The temperature of the gases at the throat is 140° F. (60° C.) measured with a Columbia recording thermometer, which works very well. These furnaces reduce, respectively, 100 to 120 and 130 to 140 tons of charge per 24 hours; they are also used for concentrating roasted matte.

Copper Refining.—The crude copper is melted in two furnaces of 125 tons aggregate daily capacity, and is molded into anodes by Walker casting machines. Twenty-six anodes are lifted out of the cooling vessel at a time, and are taken to the electrolytic plant.

The electrolytic plant comprises two systems, each of 408 vats. The current is furnished by two dynamos, each giving 4,700 amperes at 105 volts. The cathodes remain in the bath for 14 days. The weight of the residual anodes is 15 per cent.

The anode mud is swilled down into reservoirs in the cellar as at Chrome (De Lamar Copper Refining Co.), is cleaned, dried, and refined in a similar manner.

For melting the cathodes there are two reverberatory furnaces of capacity for 75 tons per 24 hours. The wire-bars and ingots are cast with a Walker machine. About 3,200 tons of refined copper are produced per month.

Copper Sulphate Manufacture.—The lyes withdrawn from the electrolytic process are worked up into copper sulphate, shot copper being added. This latter is prepared in a reverberatory furnace from matte obtained as a by-product in working up the lead. About 200 tons of copper sulphate are thus produced per month; the process used is the same as at the Oker works, Lower Harz, Germany. The crystals are rinsed, dried, and packed in strong wooden barrels.

Lead Refining.—The working up of the Mexican raw lead is carried out under the supervision of the customs officers. The lead, which is imported duty free, must be exported again. From each bar a sample is cut from above and below by means of a punch entering half way into the bar. For refining the lead there are four reverberatory furnaces of 60 tons capacity, with hearths 17 ft. 9 in. by 12 ft. 6 in., a mean depth of 14 in., and a grate area of 2 ft. 6 in. by 6 ft.; in addition to these there is a furnace of 80 tons capacity with a hearth 19 ft. 7½ in. by 9 ft. 6 in., a mean depth of 18 in., and grate area of 3 ft. by 6 ft.

For desilvering the softened lead there are five kettles, each of 60 tons capacity, 10 ft. 3 in. diameter and 39 in. depth. The zinc is stirred in with a Howard mechanical stirrer and the zinc scum is pressed dry in a Howard press, which gives a very dry scum. The latter is then, while still warm, readily hammered into pieces for the retorts.

The desilverized lead is refined in five reverberatory furnaces, of which four take a charge of 50 tons of ore each, and one 65 tons. The production of desilverized lead is 5,000 to 5,500 tons a month.

The distillation of the zinc crusts is carried out in 18 oil-fired Faber du Faur tilting furnaces. Each retort receives a charge of 1,200 lb. of broken-up crust and a little charcoal. The distillation lasts 6 to 7 hours. Fifty gallons of petroleum residues are consumed per charge. The oil is blown into the furnace with a compresed air atomizer. After withdrawing the condenser, which runs on a traveling support, the argentiferous lead is poured directly from the tilted retort into an English cupel furnace. Seven such furnaces (magnesia-lined, with movable test) are in use, of which each works up 4.5 to 5 tons of retort metal in 24 hours. The furnaces are water jacketed. The blast is introduced by the aid of a jet of steam. Three tons of coal are used per 24 hours.

Gold and Silver Parting.—The doré bars are cast into anodes for electrolytic parting by the Moebius process. The plant consists of 144 cells in 24 divisions. The mean composition of the electrolytic bath is said to be as follows: 10% free nitric acid, 17 grams silver, and 35 to 40 grams copper per liter. The current is furnished by a 62 kilowatt dynamo. One cell consumes 260 amperes at 1.75 volts. One kilowatt gives a yield of 1,600 oz. fine silver per 24 hours. The daily production of silver is almost 100,000 oz., and is exceeded at no other works. About $3,000,000 worth of metal is always on hand in the different departments.

*Translated from *Zeit f. Berg-Hütten und Salinenwesen im Preuss. Staate*, 1905, LIII. 490.

Coal in the Philippines.

Enough coal has been discovered in the island of Batan, of the Philippines group, to supply the army, the navy, and the Philippines government with 200,000 tons per annum for 348 years, according to the annual report of the Quartermaster-General of the Army. The coal has been tested on some of the inter-island transports with favorable results. The island of Batan is off the southeast coast of Luzon and at the entrance of the gulf of Albay. At present the coal used in the Philippines by the army, the navy, and the insular government comes from Australia and Japan.

Stope Box Sampling.*

BY WAGER BRADFORD.

Stope box sampling bristles with possibilities of error, and is worse than useless unless carried out with the utmost care. When the gold is coarse, the system would be of little value, but it is well adapted to the average banket ores of the Rand.

Since the commencement of milling on Langlaagte Deep a careful system of daily stope box sampling has been carried out; every sample so taken has been panned, the pan results averaged, these averages checked by assay, and an exact daily record kept of each process.

The object has been to know approximately each day the value of the ore taken from every stope in the mine during the preceding 24 hours; this object has been attained. That such knowledge is desirable needs no argument. This knowledge, however, to be serviceable, must be up-to-date at all times.

Stope box samples, regularly and properly taken and accurately panned, will on many mines afford the information necessary to raise or lower the grade in 48 hours; assuming, of course, that a reasonable accumulation of broken ore is carried in the stopes, so that a change from one to another will not reduce the tonnage. The time which must elapse before a change in grade is felt depends on the quantity of ore ahead in the shaft, headgear, sorting station and mill bins.

As far as my knowledge goes, Langlaagte Deep is the only mine on the fields where the system has been rigidly carried out over a period of years. The period covered is from March 1, 1899, to Oct. 1, 1899, when war broke out, and from the resumption of milling, Jan. 1, 1902, to Apr. 1, 1905.

During this period the tonnage sampled was 756,739. The number of samples taken at the stope boxes was 1,531,478. The number of pannings made was 31,957.

A sample was taken at the stope boxes, for every half-ton of ore trammed, and these samples were then so reduced, by mixing and quartering down those from the same stope, that each panning represented the average of 48 samples, or 24 tons. Each sample in turn, if properly taken, would consist of several portions of ore taken at intervals as the truck was filled.

The samples are taken by the trammers from time to time as the trucks are filled at each box, the fine portions being sifted through the fingers and rejected, and the coarse fragments, from the size of a pea to an egg, placed in a suitable receptacle; large pieces and very fine stuff spoil the samples. It would be better to use a strong screen instead of the fingers. The size of the samples will vary with the tonnage trammed, from 1 lb. to 50 lb.

Each morning an assistant sampler goes through the levels with his boys. He carries a sampling board and the necessary implements and bags, and after carefully mixing all the samples from any one stope, he quarters down to 2-4 lb. weight. As soon as enough samples are bagged and numbered, they are sent directly to the grinding room, while the sampler goes on through the mine. He carries, of course, a book, and enters each sample with identification number, noting any stope where samples are missing or badly taken. These omissions are reported daily to the mine captain, and if continued the ganger in charge is fined, or the contractor, as the case may be. The total number of stope samples is from 60 to 70 per day.

The panning is done every afternoon in the usual way, 1 lb. of the sample being always taken. In winter the panning water is slightly warmed. As the gold is mostly fine, very accurate results are reached.

In judging values, the panner is guided somewhat by the appearance of the pyrites, but he depends chiefly on the length of the gold tail and the coarseness of the particles, the value being higher for a given length of tail if the gold is coarse. With average ore, an inch tail represents roughly 20 dwt. per ton. This ratio would vary on different mines according to the richness of the pyrites, and a man must learn his ore by repeatedly checking his panning against assays of the identical sample.

In addition to the panning a daily check assay is made. From every sample ground for panning, a half-ounce is taken for every ton trammed from that stope. These several lots are very carefully mixed, quartered down and sent in for assay, and the result entered as a check against the average daily panning.

The second check against the average monthly panning for each stope is obtained by taking daily a similar portion for each ton trammed from each stope and placing it in a drawer bearing the stope number.

At the end of the month the contents of each drawer are well mixed, quartered and assayed.

The closeness of these daily and monthly checks is often surprising.

The sources of variation are: 1. The unequal distribution of the gold centers of the ore sampled. 2. The unequal sizing of the labor employed (*a*) in taking the samples, (*b*) in panning them.

It is evident that if the gold were equally distributed over the whole face of the stope, any sample picked up at random would exactly represent the average value of the ore.

Instead, however, of equal distribution, the gold bearing stringers of banket are separated by comparatively barren partings, and their value varies greatly.

It therefore follows that the sample of broken ore taken at the box, through which passes the rich and poor alike, must consist of fragments varying from ounces per ton to utter waste.

To get the average, it is not enough for a single grab sample to be taken from a full truck; the sample should be taken at intervals as the truck fills—here a handful, there another. Sometimes at steep boxes trucks are filled with a rush and cannot be sampled properly, but usually the ore comes out at such speed that several samples may be had.

As stated, the sample is taken by sifting through the fingers. Evidently this cannot be done with coarse ore, and this brings us to the second point, viz., the effect of the size of the broken ore on the sample.

The larger the fragment the lower the grade as a rule. This is because, in stoping, the holes are usually placed near the foot and hanging; consequently, the rich foot leader and the lower grade hanging wall stringers are often finely pulverized, while the intermediate section of the stope face, consisting largely of waste partings, breaks big, making it impossible to sample at the box.

Hence that portion of the ore which can be so sampled is necessarily of a higher average value than the whole stope product, and there thus results a more or less constant factor of difference; that is, the pan values, if the box samples are properly taken and accurately panned, should always be higher than the real value of the stope.

On any given mine, for this reason, the factor of difference must be determined, and always deducted from the pan, to get the true stope value. It will vary from time to time on the same mine, and should be calculated at regular intervals, say, every three to six months. Assuming the panning to be equally close, the factor of difference will be low where clean reef is being mined of steady average grade, and high where there is only a very thin rich leader.

*Abstract of paper in *Journal* of the Chemical, Metallurgical and Mining Society of South Africa, October, 1905.

When the Twentieth Century Limited from Chicago arrived at the Grand Central Station, New York, at 9:30 a. m., Jan. 7, on time, it brought mail from San Francisco, with the postmark of 6 p. m., Jan. 3, thus making the time across the continent only 3 days and 15½ hours. This was the first train that completed the round trip from New York to San Francisco according to the new schedule, and which, through extra speed and extra good connections, makes the round trip forty-eight hours faster than formerly.

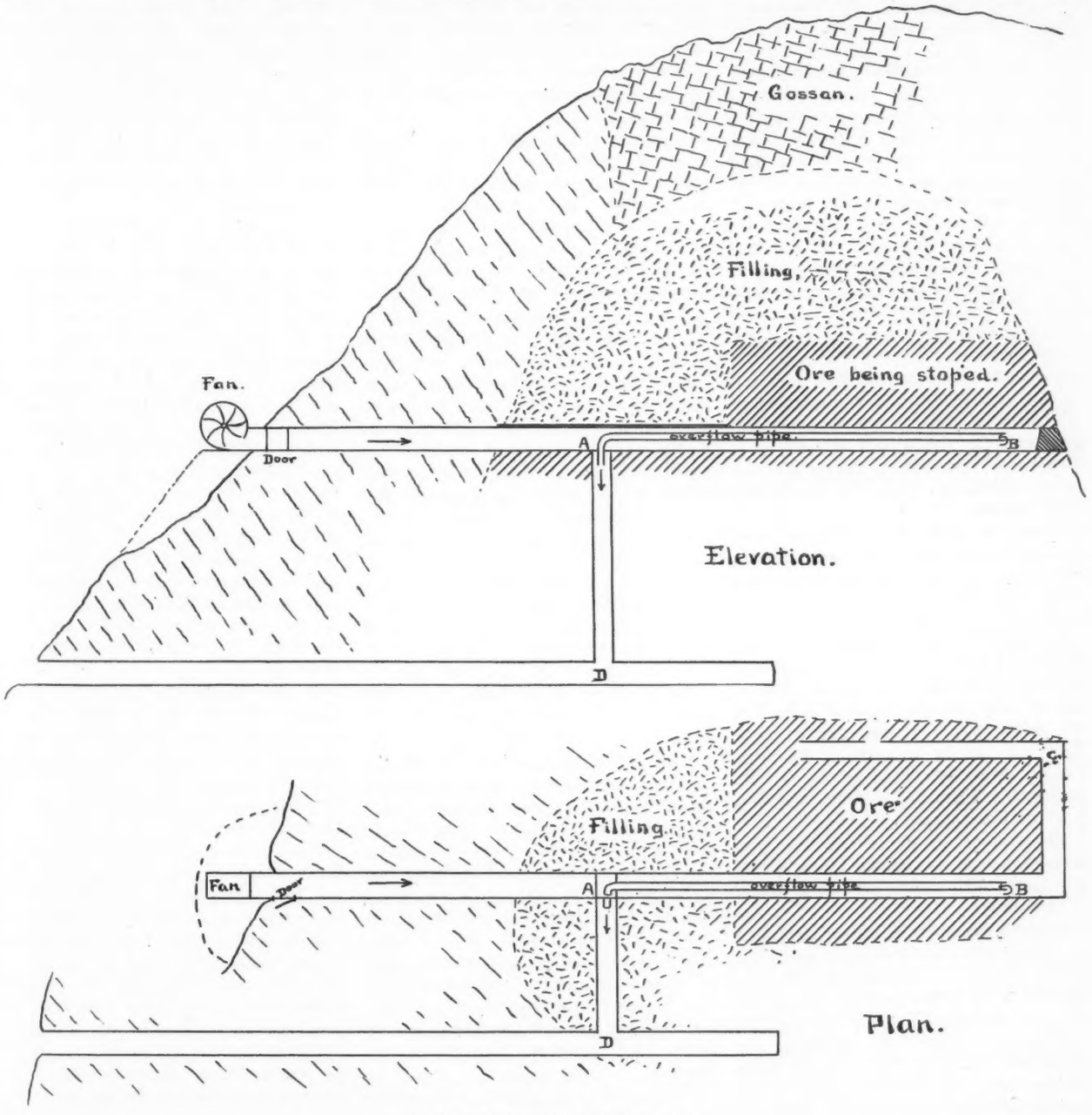
Direct contact of platinum with burning charcoal should be avoided, since the silicon reduced from the charcoal ash unites with platinum, making it brittle and liable to fracture.

Controlling and Extinguishing Fires in Pyritous Mines.

BY LEWIS T. WRIGHT.

The Iron Mountain mine in Shasta Co., California is a large mass of cupriferous iron pyrite. In mining this the immense cavities formed by the galleries, stopes, and workings are filled with rock. In course of time it was found that the mine temperature had increased and was increasing. The ventilation system was that almost invariably used in metalliferous mines, viz: natural ventilation. The pyrite in places became hot. One morning a faint odor of sulphurous acid was observed, and by midday it had increased to such an extent that a large part of the mine had to be abandoned. The mine was on fire and the gases from the fire made it necessary to leave the workings. The fire proceeded rapidly through parts of the filling and the workings, burning out the timber. The fire was extinguished by heroic means and the use of water. The problem then was, however, to find a means of cooling the working places so that work could be carried on in them, and also to prevent gases from fires that might originate in filled ground from spreading to the workings, to extinguish fire that might originate in covered ground, without interfering with the mining operations, and to prevent small traces of gases from such fires from entering the workings where their presence would drive out the miners. I was able to solve this problem by a process of reasoning based partly on knowledge derived in theoretical study, and partly by the observation of the facts of the case.

The question was "What was the cause of the heating of the ground that was the precursor and cause of the fire?" Some thought it was the pressure of the backs on the filling. No doubt in the settling and packing of this by immense weight above there might be some heat generated. So many million tons falling so many feet in such a time would produce a calculable amount of heat. Some thought it was the kaolinization of the rock filling and adjacent country. I reasoned as follows: A mass of pyrite dry and at normal temperature, like a specimen in a museum, does not become hot. does not oxidize and may for all we



PLAN AND ELEVATION OF WORKINGS.

*General manager, Mountain Copper Co., San Francisco, Cal.

know last a million years without change, if so preserved; but a heap of pyrite exposed to moisture and oxygen does oxidize, and that reaction produces heat. The majority of chemical actions proceed at a greater rate as the tempature rises. There is an initial temperature at which the action commences and proceeds slowly; then if the temperature rises, the action proceeds much faster and finally becomes very rapid and even violent.

I once performed the following experiment on a coal that was known to be fiery: I powdered it into a fine condition, moistened it, and left it in a heap. When it commenced to warm up, I placed some of it in a tube and allowed at first fresh air to pass through it, but very gently. It became warmer. I then increased the flow of air and it became hot, and then by greatly increasing the flow of air it was brought into a state of vivid combustion. The essence ot this experiment is, that where there is chemical action producing evolution of heat, care must be taken to lose heat by radiation and convection at a less rate than that at which it is produced. The temperature then will rise and the action will proceed at a faster rate; the gain in temperature becomes increasingly rapid and combustion finally ensues.

Heaps of cupriferous pyrite in Spain are washed judiciously with water for the extraction of copper, and their temperature rises, thus promoting the desired sulphatizing action, but the temperature is not allowed to rise to the point of combustion. I have seen heaps of iron filings, by careful watering and protection from loss of heat, brought in their interior to the melting point. A single wisp of straw does not rise in temperature by being exposed to moisture and air, but a heap of straw will get hot if damp, and may catch on fire by itself.

The heating of the ore in the Iron Mountain mine was caused by the action of oxygen, with moisture or water acting as a carrier.

There were, however, other factors in the problem. The workings had to be ventilated, but it was thought that the addition of air to fire would be dangerous. But take the case of a coke fire burning actively in a grate. By spreading out the embers on the ground they will cease to burn and cool off. An excess of air will in this way put out the fire. With the natural system of ventilation then in use at Iron Mountain I had frequently occasion to observe that air coming from certain crevices would put out the light of a candle and there was other evidence that the ground as a whole was porous.

There was still another factor in the problem, viz., an extinctive atmosphere, one in which certain classes of combustion cannot proceed for reason of either a total want of oxygen or its dilution by other inert cooling gases. Carbonaceous flames are extinguished when the surrounding atmosphere contains less than a certain amount of oxygen, say about 15 per cent.

The roasting of metallic sulphides proceeds less slowly when the surrounding gases are deficient in oxygen and will cease entirely when the oxygen falls below a certain amount. If the heat production is less than the heat loss by radiation or air cooling, then the temperature of a burning body will fall, and falling below the temperature of ignition will cease to burn.

Some of the factors in the problem were the porous ground; the material that was combustible and could heat itself and take fire; and the fact that it could be cooled if hot and if on fire could be extinguished either by a great excess of air, or by deficiency of it. I reasoned that by forcing through the drifts a sufficient quantity of air it would be possible to cool off the external faces of heated blocks of ore, or if an extinctive atmosphere could be maintained in the interior of the blocks of ore and filling, accumulation of this interior heating could be prevented. By maintaining in the open workings an atmospheric pressure slightly above that in the ground (which is practically that of the atmosphere), the gases from the interior could be kept from penetrating into the workings and driving us out of them. By keeping this pressure at a proper point the gases could be held in the interior where they would act as an extinctive atmosphere.

I caused, therefore, powerful fans to be fitted up at certain entrances, which were closed by doors and provided with ducts for the air from the fans. The air was driven by the fans through the workings, maintaining a pressure slightly above that of the outside atmosphere. If the friction of the air drifts was not sufficient to produce this excess over atmospheric pressure, then doors or baffles had to be adjusted to hold the gases in the interior of the blocks of ore and filling, the object being to push back the gases slowly to the surface, through the mass of ore and filling, using just enough pressure to make a movement of air from the workings through the filling, and to assure that it would not be in the reverse direction.

The system was started and within twenty-four hours the workings operated on were freed of smoke and bad air, and in a few days the heated faces of ore cooled off and became dry. If the fans were stopped a few minutes, traces of foul gases and sulphurous acid were perceived: on restarting the fans these disappeared. This was the condition desired. The foul air was being held back in the interior where it would extinguish the fire and delay or prevent combustion.

The men in charge soon became expert in the use of the system. If evidences of fire are noticed in the interior of a section of ground, by balancing the air pressure around it by means of the fans and doors, etc., the fire can be held in an extinctive atmosphere, when it quickly dies out. Use is also made of this system in attacking blocks of heated ore, the ore faces being quickly cooled off by air currents. The system installed fulfilled a triple purpose. It supplied the fresh air required by those working in the mine, cooled off the heated faces of ore and, due to the permeable nature of the ground, enabled us to keep an extinctive atmosphere in the interior of the blocks of ore and filling, and prevented the pernicious gases of smoldering fire from entering th workings.

In practice it is found that a pressure of air from 1½ to 3 in. of water gauge has to be maintained in the workings to provide the fresh air to hold back foul gases. In working up to a face of ore at the end of a drift or stope that is approached from any entry through which there is a free current of air, there may not be enough circulation of air resulting from the movement of air through the broken ore face, and an overflow pipe can be used to take some air out of the end of the chamber to a point where the pressure may be less. In a case in point, the air pressure in a chamber was 2½ in., but the movement of air through the ore was not sufficient to give a good cool circulation, and an overflow pipe was put in and this reduced the pressure in the chamber to 1½ in., but gave the required circulation.

In other casés the loss of air in its passage through the workings may be excessive because of the extremely broken character of the rock in that part of the drift. In that case it is the custom to line the sides and top with planking to prevent too great a loss of air.

The ore often has a temperature of 430° F. on a freshly broken surface, but this will cool very rapidly (in a day or so) on its exposed surface by the passage of cool air along its face. This cooling does not penetrate very deep, since holes a few inches in depth reveal the original temperature, so that the timbering has to be carefully watched, because if pressing tightly against the ore in such a manner that the cooling air cannot circulate freely between the timber and the ore, the timber will become heated and even ignited. Water lines are carried into all the stopes and there is a man on duty who extinguishes such fires.

Of the air delivered into the mine, at times as much as two-thirds is lost in the workings, only one-third reaching the exit tunnels.

The accompanying sketches show a block of ore being stopped. The overflow pipe and lining over the filling are always necessary.

Steam Pipes in Shafts.

BY R. D. O. JOHNSON.*

A steam pipe down a shaft is one of the problems about mine equipment that is, with good reason, generally regarded as never more than partially solved. It is nearly always a fruitful source of repairs and anxiety.

The difficulties arise mainly from the necessity of caring for the expansion and for the strains that arise therefrom. Various expansion joints have been devised, relying for their action upon the

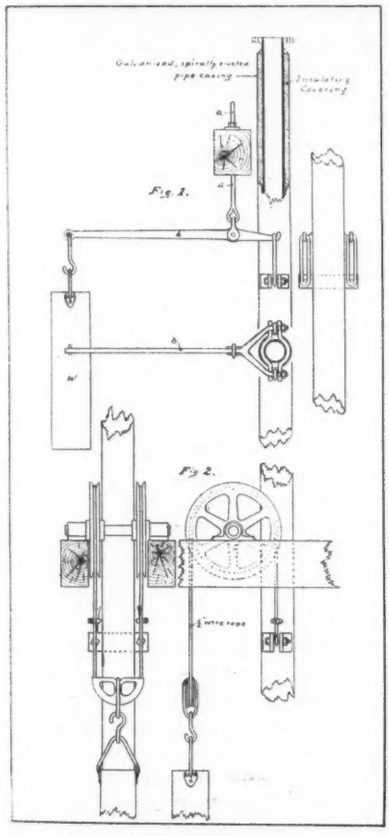


FIG. 1 AND 2.

flexibility of coiled or looped sections, or the movement permitted by "fitted" sections or the ordinary gland and stuffing box. The coiled or looped sections, though performing their office admirably if they contain a great enough length of pipe, have the disadvantages of being expensive and of taking up valuable room in the shaft. "Fitted" joints or sections are cheap and usually "home made," but soon become leaky and do not admit of ready repairs. The gland and stuffing box expansion joint is the very worst. It needs constant attention to keep it tight. It accomplishes a complete section of the pipe, the portions of the pipe above and below, being discontinuous, are thrust apart upon the admission of the steam by a stress equal to the product of the area of the pipe and the pressure of the steam. This puts the pipe under a buckling strain which it is not fitted to stand. In spite of the pipe being held in line by staple or U-bolts at each timber, it usually yields to the strain, with the result that the parts of the stuffing box joint separate rather than close up as desired to take up the expansion of the pipe. This style of joint aggravates the trouble it is designed to prevent. The pipe subjected to a frequent recurrence of buckling strains, becomes leaky at every point where there is opportunity.

The following arrangement, which I devised and employed in the shafts of the St. Louis Smelting and Refining Company at St. Francois in the lead district of south-eastern Missouri, overcame the usual difficulties and made the steam pipes down the shafts parts of the equipment to be forgotten.

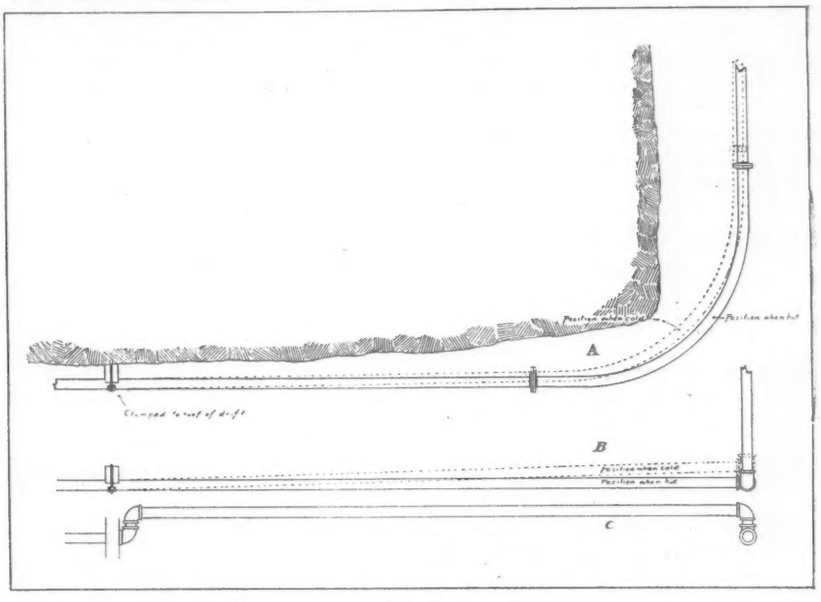


FIG. 3.

The central ideas of the scheme were to throw all of the expansion to one point, the bottom; to keep the pipes at all times under a moderate tension; and to relieve the pipes, when hot, of all stress other than that due to the pressure of the steam.

The pipes were made up in 60-ft. sections fitted with an extra heavy flange on each end. The flanges were turned, faced, and scraped so that when bolted together they were steam tight without the use of gaskets of any kind. The 60 ft. sections were made up complete on the surface ready to be lowered into place. The pipes were covered with a high-grade magnesia covering, over which was slipped a tight casing of galvanized, spirally riveted pipe. At the flanges, the casing was crimped over the covering and all spaces in the crimping, or at the points where the clamps came through the openings, were filled with plaster of paris and painted with tar to prevent any water getting access to the covering. This means of protecting the covering is much superior to the usual one of wrapping with strips of canvas and painting, and considering the labor saved, is not much more expensive.

A plumb line is dropped down the shaft at the desired point, the timbers intended to support the pipe are marked accordingly and the counter-balancing apparatus placed. The bottom section is next lowered into place and temporarily supported until the next section is placed, when the lowest counter balance is attached. The succeeding sections are then lowered and the counter balances attached until the top is reached. The top section is then solidly clamped to the timbers of the gallows frame.

The counter balances are placed every 100 feet. Where the expansion, or the movement due to expansion, does not exceed five inches, the style of counter balance shown in Fig. 1 is used. Where that amount is exceeded, the kind shown in Fig. 2 is advisable. When the pipe is hot and fully expanded, the rod *a* (Fig. 1) should be lowered so that the lever arm *b* is brought into a horizontal position. The weight *w* is made up of a piece of 8-in. pipe plugged at the bottom, fitted with a bail at the top, and weighted with scrap iron and lead concentrates.

The sections of pipe are weighed previously to lowering to place in the shaft. The counter weights *w* are calculated to balance the 100 feet of covered pipe below, leaving an excess of 100 pounds in favor of the pipe unbalanced. This excess weight is sufficient to keep the pipe in slight tension at all times Where the total length of the pipe is very great, 100 pounds excess would be too much to be left unbalanced, as the unbalanced weight has to be carried by the top sections. In very deep shafts, it would be advisable to use the counter balances every 50 feet for the first 200 or 300 feet, to prevent too great tension on the upper sections.

*Consulting mining and mechanical engineer, Denver, Colo.

The expansion joint shown in plan at C was the one which I employed. Experience indicated that the forms shown in A or B would have been preferable. Of the latter two A is to be preferred over B, as it does not depend for its movement upon turning on a threaded joint. Some of the flexible steam joints, like the Moran joint, could doubtless be substituted for the double fittings shown at C.

An expansion section of the A or B pattern should be so put in that it would be under a strain only when the pipe is retracted and cold. When hot the pipe would then assume a position of no strain.

There is a decided advantage in making up the pipe in sections. By this method, the work can be done entirely on the surface where every facility may be at hand for doing a good job. It is cheaper and much more satisfactory than work done in cramped and badly lighted spaces.

An extra complete section should be kept in stock on the surface to immediately replace any section that may be damaged by accident.

Production and Properties of Tantalum.*

BY IVAR NORDENSKJOLD.

Absolutely pure tantalum can be obtained by decomposing its oxide by passing an electric current through it in a vacuum, thereby also causing it to glow; or an electric arc can be used to smelt the oxide in a vacuum. The metal can likewise be produced by the Goldschmidt aluminothermic method; but the product is largely alloyed with aluminum, and is brittle, whereas the pure metal is rather hard and remarkably malleable.

The melting point of pure tantalum is 2,250°-2,300°; specific heat 0.0365; atomic heat 6.64, agreeing well with Dulong and Petit's rule. Specific gravity of cast metal 16.64; this is half as much again as the old values, which must have been determined from impure material. Coefficient of linear expansion 0.0000079, between 0° and 50°. Specific electrical resistance 0.165 ohm in a wire 1 m. (39.37 in.) long and having 1 sq. mm. (0.00155 sq. in.) area of cross section, with an average rise of 0.3% per degree of temperature between 0° and 100° C, and 0.26% between 0° and 350°. Tensile strength of a wire 1 mm. (0.04 in.) in diameter, 93 kg. per sq. mm. (59 tons per sq. in.); elongation 1 to 2%; modulus of elasticity of a wire 0.08 mm. (0.003 in.) in diameter, 19,000 kg. per sq. mm. (12,000 tons per sq. in.). At a red heat tantalum can readily be hammered out in a sheet, which under repeated heatings and hammerings acquires a hardness but little below that of the diamond.

Tantalum alloys readily with hydrogen, of which only a portion can be driven off, and with difficulty, by melting; but the hydrogen seems not to affect the properties of the metal. Only with difficulty is tantalum oxidized; at 400° it seems to tarnish slightly yellow, turning to blue at a low red heat; finally the surface of the wire becomes coated with a white layer of pentoxide. On sending an electric current through a wire under an air-pump bell, into which oxygen is gradually admitted, the metal does not oxidize so long as the pressure is below 0.026 atmosphere, and very slowly above this pressure. A wire of oxide, heated in the same way in a vacuum, gives off its oxygen. Heated in nitrogen, tantalum absorbs the gas, and becomes dulled and brittle. It alloys well with iron, which it hardens just as vanadium does. Carbon combines with it in solution, rendering it brittle and hard. Tantalum accordingly ranks high among the "noble" metals, as it withstands the atmosphere so well, and is not attacked by either acids or alkalies.

A 25-candle glow-lamp lit with a tension of 110 volts requires 650 mm. (25 in.) length of a tantalum wire 0.05 mm. (0.002 in.) in diameter, which has to be coiled in several loops in order to go inside a glass bulb of ordinary size. Such a lamp will burn with full light for 400 to 600 hours; with less light, more than twice as long. The power absorbed is about 1½ watt per candle-power, or less than half the power required with carbon filaments.

*Abstracted from *Le Génie*, 1905.

Efficiency of a 500-H. P. Gas Engine.*

BY E. MEYER.

The engine was of the Oechelhäuser type, built for use with blast-furnace gas, and fitted with a double-acting charging pump, delivering on the one side air and on the other gas, to the working cylinder. To fit the engine for working with the stronger gas from coke-ovens, both sides of the charging pump were arranged to deliver air, the gas being supplied by a separate pump; but as this arrangement gave an excess of air, a blow-off valve was provided between the pump and the cylinder. For adjusting the relative apertures of the air and gas ports, the latter were fitted with a sliding collar.

The principal dimensions of the engine were as follows: Diameter of working double-piston cylinder 27 in., stroke of front piston 38 in., stroke of back piston 37½ in.; diameter of air-pump cylinder 45 in., stroke 20 in.; diameter of gas-pump cylinder 23½ in., stroke 20 in. The engine was employed to drive a 66-in. blast-furnace blower, coupled direct to the tail piston.

The coke-oven gas ranged in calorific power from 3,112 to 3,860 heat units per cu. m. The best results in the tests were obtained with the gas-valve half open and the air blow-off valve about one-quarter open. Under these conditions, and running at 110 r.p.m., the engine developed a useful effect of 628 h.p., with a consumption of 15,220 cu. ft. of gas per hour, and a heat consumption of 1,290,000 units. The indicated horse-power was 765, of which 137 h.p. was consumed in overcoming the internal friction of the machine. The mechanical efficiency of the engine was 82.13%.

A series of other tests made, with the gas and air valves adjusted in different ways, led to the following general conclusions: For a given engine-speed the consumption of power per revolution by the air-pump varies directly with the load; and conversely with a given load the consumption per revolution varies with the speed. The ratio between the consumption of power by the pump and the indicated power of the engine varies inversely with the load. For a given load this ratio diminishes with the speed, but not to any considerable extent. Under full load and at normal speed, about 15% of the indicated work is absorbed by the charging pump. Tests made at widely different speeds show that the consumption of heat per indicated horse-power-hour is only about 1,660 heat units, so that about 38% of the calorific power of the gas is converted into indicated power, though when the load is reduced to about 0.42, the consumption of heat rises to 1,820 units. Owing to the diminution of the mechanical efficiency, however, the consumption of heat per horse-power-hour of useful effect increases rapidly as the load decreases.

*Abstract of an article in *Zeitschrift des Vereines deutscher Ingenieure*, Berlin, 1905, XLIX. 324-330.

Zinc Smelting in Colorado.

According to the reports furnished by the companies to the local newspapers, the United States Zinc Co. (plant at Pueblo) purchased, in 1905, ore to the amount of 28,494 tons, containing 9,556 tons of zinc, an average of 33.5%. The production of spelter for the year was 6,544 tons.

The United States Smelting Co. (plant at Cañon City) smelted 33,000 tons of ore, containing 7,500 tons of zinc (22.7%), 2,900 tons of lead (8.8%), 600 tons of copper (1.8%), 300,000 oz. of silver (9 oz. per ton), and 2,200 oz. of gold (0.066 oz. per ton). Excepting 800 tons of ore from Arizona, all was obtained from Colorado. The products of this plant are zinc-lead pigment and copper matte. The averages computed do not show the grade of zinc ore smelted, inasmuch as some copper ore, free from zinc, is smelted along with the zinc ore.

Contact of platinum with compounds of the easily reducible metals is dangerous at high temperatures, as alloys with platinum having a low fusing point are readily formed. This is especially true of lead.

Experiments on the Metallurgical Behavior of a Mixture of Lead Sulphide and Calcium Sulphate.*

BY F. O. DOELTZ.†

In his English patent[1], for desulphurizing sulphide ores, A. D. Carmichael states that a mixture of lead sulphide and calcium sulphate reacts "at dull red heat, say about 400° C.," forming lead sulphate and calcium sulphide, according to the equation:

$$PbS + CaSO_4 = PbSO_4 + CaS$$

Judging from thermochemical data, this reaction does not seem probable. According to Roberts-Austen[2], the heats of formation (in kilogram-calories) of the different compounds in this equation are as follows: PbS = 17.8; $CaSO_4$ = 318.4; $PbSO_4$ = 216.2; CaS = 92. Hence we have the algebraic sum:

$$-17.8 - 318.4 + 216.2 + 92 = -28.0 \text{ cal.}$$

As the law of maximum work does not hold, experiment only can decide whether this decomposition takes place or not. The following experiments were made:

Experiment 1.—Coarsely crystalline, and specially pure galena was ground to powder. Some gypsum was powdered, and then calcined. The powdered galena and calcined gypsum were mixed in molecular proportions ($PbS + CaSO_4$), and heated for 1½ hours to 400° C., in a stream of carbon dioxide in a platinum resistance furnace. The temperature was measured with a Le Chatelier pyrometer. The material was allowed to cool in a current of carbon dioxide.

The mixture showed no signs of reaction. Under the magnifying glass the bright cube-faces of galena could be clearly distinguished. If any reaction had taken place, in accordance with the equation given above, no bright faces of galena would have remained.

Experiment 2.—A similar mixture was slowly heated, also in the electric furnace, to 850° C., in a stream of carbon dioxide, and was kept at this temperature for one hour.

It was observed that some galena sublimed without decomposition, being redeposited at the colder end of the porcelain boat (7 cm. long), in the form of small shining crystals. The residue was a mixture of dark particles of galena and white particles of gypsum, in which no evidence of any reaction was visible under the microscope. That galena sublimes markedly below its melting point, has already been noted by Lodin[3].

Experiment 3.—In order to determine whether the inverse reaction takes place, for which the heat of reaction is + 28.0 cal., the following equations are given:

$$PbSO_4 + CaS = PbS + CaSO_4;$$
$$-216.2 - 92 + 17.8 + 318.4 = 28$$

A mixture of lead sulphate and calcium sulphide was heated in a porcelain crucible in a benzine-bunsen flame (Barthel burner). The materials were supplied expressly "for scientific investigation" by the firm, C. A. F. Kahlbaum.

The white mixture turned dark and presently assumed the color which would correspond to its conversion into lead sulphide and calcium sulphate. This experiment is easy to perform.

Experiment 4.—The same materials, lead sulphate and calcium sulphide, were mixed in molecular ratio ($PbSO_4$: CaS), and were heated for 30 minutes to 400° C., on a porcelain boat in the electric furnace, in a current of carbon dioxide. The mixture was allowed to cool in a stream of carbon dioxide, and was withdrawn from the furnace the next day (the experiment having been made in the evening).

The mixture showed a dark coloration, similar to that of the last experiment; but a few white particles were still recognizable. The material in the boat smelled of hydrogen sulphide.

Experiment 5.—A mixture of pure galena and calcined gypsum, in molecular ratio (PbS : $CaSO_4$), was placed on a covered scorifier and introduced into the hot muffle of a petroleum furnace, at 700 to 800° C. The temperature was then raised to 1100° C.

From 5 g. of the mixture, a dark-gray porous cake weighing 3.7 g. was thus obtained. There was some undecomposed gypsum present, recognizable under the magnifying glass. No metallic lead had separated out. When hot hydrochloric acid was poured over the mixture, it evolved hydrogen sulphide. The fracture of the cake showed isolated shining spots. The supposition that it was melted or sublimed galena was confirmed by the aspect of the cake when cut with a knife; the surface showed the typical appearance of the cut surface of melted galena. On cutting, the cake was found to be brittle, with a tendency to crumble. On boiling with acetic acid, a little lead went into solution. Wetting with water did not change the color of the crushed cake.

Experiment 6.—In his experiments for determining the melting point of galena, Lodin[4] found that, in addition to its sublimation at a comparatively low temperature, the galena also undergoes oxidation if carbon dioxide is used as the "neutral" atmosphere. Lodin was therefore compelled to use a stream of nitrogen in his determination of the melting point of galena. Now the temperature of experiment 2 (850° C.), described heretofore, is not as high as the melting point of galena (which lies between 930 and 940° C.); therefore experiment 2 was repeated in a stream of nitrogen, so as to insure a really neutral atmosphere. A mixture of galena and calcined gypsum in molecular ratio (PbS : $CaSO_4$) was heated to 850° C.; was kept at this temperature for one hour; and allowed to cool, the entire operation being carried out in a stream of nitrogen.

Again, galena had sublimed away from the hotter end of the porcelain boat (6.5 cm. long), and had been partially deposited in the form of small crystals of lead sulphide at the colder end. The material in the boat consisted of a mixture of particles having the dark color of galena, and others with the white color of gypsum, the original crystals of gypsum and the bright surfaces of the lead sulphide being distinctly recognizable under the magnifying glass. The loss in weight was 1.9%.

Experiment 7.—For the same reason as in 2, experiment 5 was also repeated, using a current of nitrogen. A mixture of galena and calcined gypsum, in molecular ratio ($PbS + CaSO_4$) was heated in a porcelain boat to 1030° C., in a platinum-resistance furnace, and allowed to cool, being surrounded by a stream of nitrogen during the whole period.

Some sublimation of lead sulphide again took place. The mixture was seen to consist of white particles of gypsum, and others dark, like galena. The loss in weight was 3.5%. The mixture had sintered together slightly; with hot hydrochloric acid, it evolved hydrogen sulphide. On boiling with acetic acid, a little lead (only a trace), went into solution. There was, therefore, practically no lead oxide present; no metallic lead had separated out.

Experiment 8.—In experiment 3, lead sulphate and calcium sulphide were mixed roughly and by hand (i. e., not weighed out in molecular ratio); in this experiment such a mixture of lead sulphate and calcium sulphide in molecular ratio ($PbSO_4 + CaS$) was heated in a porcelain crucible in a benzine-bunsen flame. It presently turned dark, and a dark gray product was obtained, as in the former experiment.

Experiment 9.—In a mixture of lead sulphate and sodium sulphide in molecular ratio ($PbSO_4 + Na_2S$), the constituents react directly on rubbing together in a porcelain mortar. The mass turns dark gray, with formation of lead sulphide and sodium sulphate.

If a similar mixture is heated, it also turns dark gray. On lixiviation with water, a solution is obtained which gives a dense white precipitate with barium chloride.

Experiment 10.—If lead sulphate and calcium sulphide are rubbed together in a mortar, the mass turns a grayish-black.

Conclusion.—From these experiments I infer that the reaction:

*Translated from *Metallurgie* Vol. II, No. 19.

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[1]English patent, No. 17580, Jan. 30, 1902, "Improved process for desulphurizing sulphide ores."

[2]W. C. Roberts-Austen, *An Introduction to the Study of Metallurgy*, London, 1902.

[3]A. Lodin, *Comptes rendus*, 1895, CXX, 1164-1167; *Berg u. Huttenm. Ztg.*, 1903, p. 63.

[4]*Comptes rendus*, loc. cit.

$PbS + CaSO_4 = PbSO_4 + CaS$

does not take place, but on the contrary, that when lead sulphate and calcium sulphide are brought together, the tendency is to form lead sulphide and calcium sulphate.

Nevertheless, on heating a mixture of galena and gypsum in contact with air, lead sulphate will be formed along with lead oxide; not, however, owing to any double decomposition of the galena with the gypsum, but rather to the formation of lead sulphate from lead oxide and sulphuric acid produced by catalysis, thus:

$PbO + SO_2 + O = PbSO_4$.

This is the well known process which always takes place in roasting galena, the explanation of which was familiar to Carl Friedrich Plattner. That the presence of gypsum has any chemical influence on this process, seems to be out of the question according to the above experiments.

The Zinc Industry in Silesia in 1905.

BY PAUL SPEIER.*

The business in 1905 was extraordinarily satisfactory, particularly during the second half of the year when consumers came into the market with large orders. The result was that prices rose to a height which had previously not been attained since 1899, and before that since 1873. The unusually favorable situation of the market led naturally to plans for the increase in capacity of existing works, and the erection of new works.

The spelter production of Upper Silesia in 1905 was about 128,000 metric tons. The monthly range of the market, for usual brands, per 50 kg., t. o. b. Breslau, was as follows: January: 24.90—25.25—24.75 marks. February: 24.75—24.90—24.35. March: 24.35—23.85. April: 23.85 to 23.75—23.80. May: 23.85—23.50—23.85. June: 23.85 to 24.10—23.90. July: 23.90—24.25—24. August: 24—25.75. September: 25.80—26.50—26—27.50. October: 27.75—28.25. November: 28.25—28—28.25. December: 28.25—28.45.

The capacity of the Bernhardihütte was increased by the erection of new furnaces. At Kunigundehütte a new plant, including a roasting installation and a sulphuric acid works, was erected. The Kunigunde, Klara and Franz works, belonging to H. Roth, together with the Rosamunde works belonging to the Oberschlesischen Eisenbahn-Badarfs-Aktiengesellschaft, were consolidated and taken over by a new company called the Oberschlesischen Zinkhütten-Aktiengesellschaft. The entire mining and smelting business of Prince Hohenlohe was taken over by a company called the Hohenlohe-Werke-Aktiengesellschaft.

In view of the steadily increasing use of blende by the smelters, which results in an enrichment in the zinc content of the charge for their furnaces, the smelters of Silesia are more and more changing their furnaces from the old type to the Rhenish type. Further progress in this direction was made in 1905. At the end of the year there were in use 316 furnaces, with about 12,500 muffles of the old type, with a single row of muffles; and 162 furnaces, with about 15,000 muffles, of the Rhenish type, with several rows of muffles.

Among the novelties in the metallurgy of zinc in 1905 are several new patents for the electrothermic smelting of the ore, and several for the electrometallurgical treatment in the wet way. The electrothermic smelting of zinc ore is being carried out successfully by C. P. G. de Laval in Sweden. His process is said to be distinguished by low cost of operation, simplicity and high extraction of metal.

Several new attempts have been made to smelt zinc ore in the blast-furnace. The Schmieder process has been tried experimentally at the Kunigundehütte. Kellermann has obtained a patent for zinc reduction in a cylindrical furnace, but it appears doubtful if his designs will afford the requisite temperature.

In the present practice of zinc smelting in Silesia there is a very serious loss of metal, this amounting to approximately 20%. During the very recent years, however, this loss has been considerably reduced at some works in Silesia, by improvements in the smelting practice, especially the adoption of the Rhenish furnace.

The continued high price for spelter has stimulated important experiments upon the treatment of low-grade calamine ore, with view to the extraction therefrom of a rich zinc oxide, which can then be passed on to the smelting process. An experimental plant of this character is in operation at the Elizabeth dressing works. The Zinkgewinnungsgesellschaft m. b. H., of Berlin, has purchased a large dump of calamine tailings, containing about 10% zinc, which it is aiming to rework metallurgically. The scheme which is being tried at the Elizabeth dressing works is based on the distillation of the ore. [Probably in grate-kilns as in the Wetherill process of oxide manufacture.] The Berlin company, on the other hand, is aiming to effect an extraction of the zinc oxide by means of dilute acid and precipitate hydroxide of zinc by means of lime. Neither of these processes, up to the present time, has passed beyond the experimental stage.

The business in sheet zinc in Silesia was also very satisfactory in 1905. The production was about 54,000 metric tons. The companies which are engaged in the rolling of sheet zinc in Silesia are combined in a union, this including the mills at Lipine, Ohlau, Jedlitze, Piela, Hohenlohehütte, Schoppinitz, Antonienhütte, Kunigundehütte (at Myslowitz), and the Humboldt works at Kalk, near Cologne.

The Wetherill and Mechernich systems of magnetic separation are coming increasingly into use. An installation of this character is in operation at the smeltery at Lipine. For the concentration of low-grade zinc ore, the chemical process of Dr. Danziger is worthy of mention. In this process, pyritous zinc ore is treated by a roasting to convert the iron into sulphate, which can be leached out with water, leaving the blende behind.

For the roasting of zinc blende, there are at present in Silesia 12 plants, which have 128 furnaces, the gases from which are wasted; 144 furnaces, the gases from which are utilized for the manufacture of sulphuric acid; and 10 furnaces, the gases from which are utilized for the manufacture of sulphurous acid.

The mechanical roasting furnaces, which are so extensively in use in the United States, have not yet found wide employment in Silesia. The Bergwerksgesellschaft Georg von Giesche's Erben has six large mechanical furnaces in use. It was necessary, however, to make important modifications in these furnaces before they could be successfully employed. The application of mechanical furnaces to the roasting of zinc blende without utilization of the gases for sulphuric acid manufacture is a good deal simpler than when the gases have to be employed for that purpose. After numerous experiments, a design of furnace was perfected wherein producer gas for the heating of the roasting-muffle could be employed with favorable economic results.

Some experiments have been made at the Rosamundehütte upon the employment of carborundum in the mixture for muffle manufacture. This gave favorable results. In general, in Silesia at the present time the muffles are made by hydraulic presses, as in good practice in zinc smelting elsewhere. The lining of these hydraulically pressed retorts with a special refractory material would appear to offer further advantages.

Coatings of cement have been employed to protect the metallic portion of bridges from destruction by reason of oxidation, through being continually exposed to the action of steam and gas from locomotives. The method of applying the cement consists in first brushing down the iron work with a leather broom, dampening it with a brush, and then applying two coats of portland cement wash made rather thick and having added to it a small proportion of fine, sharp sand. A mixture of portland cement and linseed oil is also used on brickwork with good results.

Practically the only use for iridium is in the points of gold pens, for which it is admirably suited. It is steel-hard and does not corrode. Even aqua regia fails to dissolve massive iridium.

*Breslau, Prussia.

The Pennsylvania Mining Law.*

BY THOMAS K. ADAMS.

The present law was enacted 12½ years ago and it was then considered sufficient to afford reasonable protection to mine workers. However, the development in the coal-mining industry has been so rapid in recent years that the dangers incident to mining have been greatly multiplied. It has become very evident to mining men that regulations which gave reasonable protection 12½ years ago do not properly safeguard the workingmen against the dangerous conditions in mines of to-day. Mine operators and managers do not often of their own initiative provide necessary safeguards for the protection of their employees; hence stricter laws are required to get by compulsion the safeguards which are necessary.

A mine superintendent before being appointed to such a position should have had at least 10 years' practical experience in or about the mines of the State, and have a theoretical and practical knowledge of the different methods of working mines, of mine gases, and ventilation of mines, etc., and should be required to make a thorough examination of the mine at least every two weeks.

The mine inspector should be granted greater discretionary powers. When the interpretation of any mining term is to be made, that interpretation rendered by the mining inspector should be accepted unreservedly until the Court has acted thereon, but should any one fail to comply with the decision of the inspector the said inspector should have the power to prosecute immediately the person failing to comply with his orders. All plans by which the coal seams are to be extracted, the size of pillars, entries, airways, traveling ways, methods of ventilating the mines and the power used, the manner of wiring and conveying of electric currents and the placing of trolley lines in the mines before the adoption or installation of all such, should first be approved by the mine inspector. The mine inspector should visit the mines as often as possible and at his discretion and not at three-month periods; he should be relieved from the duty of examining applicants for mine foremen and fire bosses (a single examining board should be appointed by the Governor to examine all applicants for mine inspectors, mine foremen, and fire bosses); he should be relieved from acting as sealer of weights and measures; and of the duty of collecting mining statistics at the end of each year and his annual report should largely consist of a written description of the mines and of the fatal accidents and the making of suggestions for the safe operation of mines.

The mine foreman, owing to the nature of the duties to be performed by him, has more to do with making the mining law effective than has any other official employed in or about the mines; this being true, it would be advisable to enlarge his authority and responsibilities. To secure the most efficient service from such an official the law should make the tenure of his position more secure. He should not be subject to loss of position merely at the caprice of irresponsible men who are possibly less intelligent about mining matters than himself, but only for just and sufficient cause, and his dismissal should not take place unless approved by the mine inspector. His responsibilities should be enlarged and more definitely fixed and whenever he discovers a violation of law by any class of workingmen or persons he should be required immediately to enter proceedings against offenders and call upon the inspector to see that all of these cases are prosecuted to a finality. He alone should have the authority to employ all inside employees and to designate the different ones to be engaged on the different grades of work in the mine. He should have exclusive control of all inside operations of the mine and see to the systematic posting of all working places and see that the system of posting adopted be strictly continued during his supervision and control. He should also supply all miners with suitable timbers and see that they are placed in their working places without their solicitation; he should see that every person he employs for mine work understands the mine rules before he allows him to enter the mine and that the said employee is competent to do the work required of him with safety, and should any person be employed who is unable to understand the English language, the rules printed in the language he does understand should be read to him by some one competent to do so, and if any instruction he may give to persons in the mine cannot be understood by reason of difference of language the mine foreman should be authorized to employ interpreters so as to interpret his instructions; he should not be allowed to employ an inexperienced person to work in the mine, except in company with an experienced person, until such a time when he is satisfied that such person can do the work with reasonable safety by himself.

The annulling of mine foremen's and fire-bosses' certificates by reason of their intemperance or their neglect to perform their legal duties should be done by the same authority that granted them.

The mine inspector should be granted the power to decide as to the number of fire bosses to be employed at each gassy mine and decide also when assistants to mine foremen are necessary and the number at each mine.

The fire bosses at gaseous mines should be required to examine the workings during the day as well as before the miners go to work.

The fire bosses or shot firers should determine where shots should be placed and the amount of explosive to be used for each shot in gassy mines, and the shots should be fired at night.

When explosive gas is produced in any part of a mine in dangerous quantities, the employes in all parts of said mine should work exclusively with locked safety lamps.

All non-gaseous mines, especially the traveling ways and entries, should be examined before the miners enter them.

Mine maps should exhibit, in chart form, the depth of strata overlying the coal seam of the different parts of the coal field, giving the nature of strata as far as possible.

A simpler method of enforcing the mining law, especially with persons committing minor offenses, must be devised.

The responsibility for seeing that only pure oil is used in the mines should be placed on the mine foreman.

The quality or grade of explosives to be used in the mines should be determined by State authority. All powder sold to workingmen at the mines should be made up in 5-lb. or 10-lb. canisters.

Boys should not be allowed in the mines until they are 14 years of age and then only admitted to them upon certificate sworn to by their parents and certificate approved by the mine inspector. All boys before they are allowed in the mines should be able to read, write, spell, and understand the common rules of arithmetic in such a way as would be satisfactory to the mine inspector or upon certificate of the school teacher of the district where the boys reside.

What constitutes the proper mining of coal should have a more general application than it has in the present law and the inspector alone should decide what constitutes it in the district over which he has charge.

At all shaft and slope mines, especially, ample supply of water and fire equipment should be provided satisfactory to the mine inspector.

If the present mining law should be amended along the lines herein suggested, with all the safety requirements installed; with the duties and responsibilites of mine operators, mine officials, and mine employees fully set forth and clearly defined; with all persons engaged in and about the mines showing dutiful obedience to and respect for the law; also with the securing of speedy trials, certainty of conviction and punishment by penalties commensurate with the offenses; together with judges and juries fully appreciating the injurious effects likely to arise from showing too much leniency to the offenders, and finally, with a proper enforcement of its provisions—should such things prevail, I am confident that a great reduction of mine accidents would result.

*Abstract of a paper read before the Western Pennsylvania Central Mining Institute.

A Combined Siphon-Spout and Matte-Trap.

BY HENRY HARRIS.*

In smelting in a blast furnace, many advantages would be gained, if a means could be devised by which all products would be constantly maintained at the same level on the hearth of the furnace, and free to be automatically discharged at a speed equal to their rate of formation.

Slag losses are largely due, indirectly, to the oxidation of the matte while issuing from the tap-hole in a stream together with the slag. Doubtless the separation of matte from slag, as they exist in the hearth of the furnace before tapping, is well defined and more perfect than that attained in an outside forehearth. From time to time, various forms of taps and separators have been designed with a view to maintaining while tapping, this better separation already said to exist; but without much success.

In lead smelting in particular, one object greatly to be desired is the keeping of a constant pressure on the lead in the crucible, in order to afford a constant hearth-level and a continuous flow of lead. This can only be obtained by keeping a constant head of matte and slag on its surface.

Intermittent tapping also suggests intermittent smelting. For, with each drop in the level of the slag below the tuyeres, the lower protion of the charge also drops to a point which cannot easily be reached by the blast until it rises on the surface of the slag formed by the smelting of an upper layer; and even then, it is so fully charged with matte, that the impregnated coke, being rendered less porous, is less susceptible to oxidation. If we are ready to admit, that, at least to some extent, our speed of smelting depends upon the rate at which we can burn our coke, then it follows that intermittent tapping means a loss of tonnage. This is especially the case in smelting charges high in lead and zinc.

In following this line of reasoning, I designed a combination siphon-spout and matte-trap which has been used continuously for some months on two blast-furnaces of widely different capacity, smelting base lead ores with pleasing results. As was expected, slag value dropped; but what was surprising was, that a great range of heavy slags of various composition and hitherto incompatible with clean results, were found to give good satisfaction. Even a slag high in iron and low in earthly bases, on a charge with a large proportion of ore high in silver and raw zinc-blende, gave good results. This will be appreciated by metallurgists who have met with similar conditions and the resulting sponge of a light "zinc-matte" of uncertain composition, so extremely difficult, if not impossible to separate in a forehearth.

With this combined siphon-spout and matte-trap, bad crucible crusts are also a thing of the past, a continuous connection with the lead being easily maintained. Also in obtaining a constant flow of matte, it will be clear that a considerable saving in labor and material at the furnaces has been effected; for, in avoiding the periodic tapping of large quantities of matte at one time, it is obvious that less labor is needed, while a small continuous trickle of matte into a bowl does not occassion the destruction which a heavy stream would. Moreover, this small steady stream may very advantageously be automatically granulated.

Former designs of matte-traps and tymps on furnaces of low capacity have failed; but this new apparatus has done good service on a small furnace, which, on rare occasions, smelted as little as 50 tons daily, and produced only eight tons of matte, and little slag, on a zinky charge high in lead.

The apparatus, not being an integral part of the furnace, may be removed, or a change effected, in a few minutes.

It consists of an L-shaped cast-iron box, about 30 in. long, lined with tile or water-jacketed to suit conditions; this box is placed in free communication with the tap-hole of the furnace, which should be as wide as possible. The walls are deep enough to afford a sufficient head to retain the amount of slag and matte desired in the furnace. Placed in this box, and at right angles to the face of the tap jacket, is a water-jacket partition, below which is an aperture a few inches in height, serving to divert the matte laterally. Referring to the drawing sketches: Fig. 1 is a diagram showing the manner of operation; Fig. 2 is a cross-section on the line *A A* in Fig. 1; Fig 3 shows a plan of the actual apparatus; Fig. 4 is a vertical section on the line *BB* in Fig. 3.

The manner of operation is as follows: The apparatus is pressed closely against the tap-jacket *E*, of the furnace, with its bottom on a level with the bottom of the tap hole *E*. When the furnace is in full operation the matte and slag are maintained within the furnace at levels corresponding to the head afforded by the height of the slag and matte overflows, *O* and *P*.

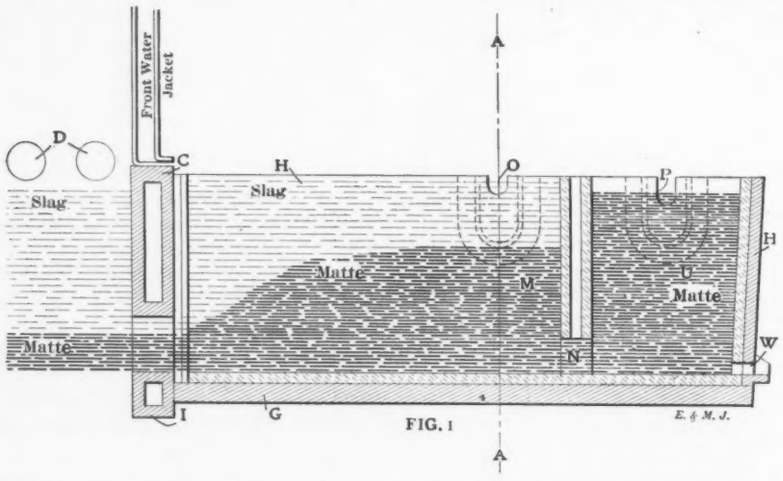


FIG. 1

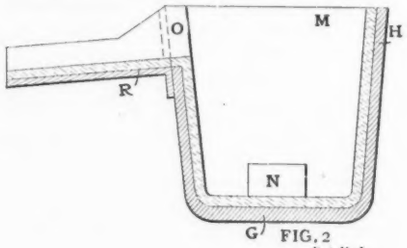


FIG. 2

The slag from the double stream flowing from the furnace is arrested by the water jacket barrier *M*, and retained in the first division *T* to overflow at *O*; while the matte flows through the space *N* into the second division *U*, it rises until its head balances that of the matte and slag in the first division of the box (or that of the matte, slag and blast pressure in the furnace) and overflows at *P*. It will thus be seen that the levels of matte and slag in the furnace will depend upon the weight of blast and the height of the overflows, *O* and *P*, which may be varied considerably at the will of the furnaceman.

Its operation requires but little attention or skill, and it will run for two or three weeks without change; any adjustment is quickly effected, the apparatus being mounted on small wheels which run on rails on a truck placed at a height corresponding to two short rails at the furnace.

It is not bolted in any way to the furnace, the only connection necessary being made by tamping a small quantity of fire clay in the groove *L;* when filled with slag which chills between the surface of the jacket and the flange, this makes an efficient seal under the most stringent conditions.

*Assistant superintendent, Hall Mining and Smelting Co., Nelson, B. C.

The tap hole *V* is provided to tap out any small quantity of lead which may accumulate, and also for tapping out the fluid contents of the furnace when necessary.

Where the production of matte falls extremely low, the operator does not attempt a continuous flow of matte for any length of time but builds up the level of the matte overflow, reducing it at regular intervals. The oscillation of the contents of the box due to the blast, prevents in this design the solidification of the matte even when it is allowed to stand for a reasonable time. However, should the matte in the second division *U*, become solidified, it is easily removed without interfering in the least with the operation of the furnace.

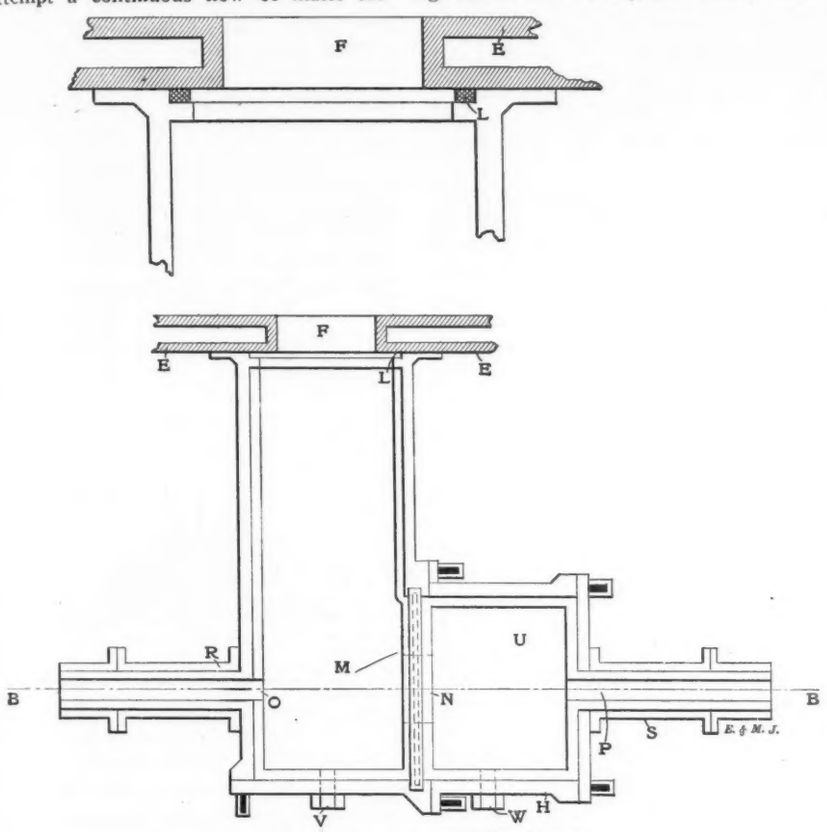


FIG. 3. SIPHON-SPOUT AND MATTE-TRAP.

It is hard to get a proper dry mixing in any revolving batch concrete-mixer that has just previously discharged a wet batch. A considerable quantity of the cement of the next batch will adhere to the wet surfaces of the mixer, and a careful examination of the finished product will usually show small isolated bunches of cement; also stones with their crevices full of water, instead of being full of cement.

The Phoenicians built a concrete aqueduct 70 miles long for the ancient city of Carthage in North Africa.

Speed of Rolls and Crushers.

The proper speed at which a rock breaker or crushing rolls should be run is of obvious importance, since it directly governs the output, and large output being one of the chief objects in many mills there is a tendency to run crushers at higher speeds than formerly. This is especially the case with rolls, the speed of the old Cornish rolls having been multiplied many times in modern design. Various points however need consideration; for instance one mill changed the speed of a pair of rolls from 102 to 92 r. p. m., to overcome excessive wear of the cast steel faces; while another in crushing a limestone-galena changed from 35 to 28 r. p. m. to prevent glazing.

H. W. Gartrell has recently made an investigation (reported in *School of Mines Quarterly*, XXVII, i, 28-33, November, 1905) of the effect of variations in the speed of crushing machinery upon the production of undersized material, which is responsible for so large a proportion of the losses of many mills. High speeds have been sometimes supposed to result in an undue proportion of such material.

The results obtained by Mr. Gartrell seem to admit of only one interpretation, viz., that while decrease of speed tends to decrease the production of undersized material, it only does so in a degree so small that in general it is altogether disproportionate to the disadvantage of decreased capacity. Moreover the range both in speeds and in tenacity of material in his experiments were sufficiently great to render it probable that similar results would be obtained under almost all conditions.

Economical Handling of Earth.

The *Engineering Record* (July 6, 1906, p. 31) gives details of unusually economic handling of earth on a contract held by H. W. Hawley, of Seattle, Wash. Wagons are loaded by a steam shovel and hauled to a platform, where they are dumped into empty cars; this platform is built over the upper end of a double track narrow-gauge tramway which has sufficient grade to allow a loaded 4-yd. car to haul up an unloaded car by a rope passing around a sheave under the platform. The cars are controlled by a friction rope around this sheave. After the wagons dump their contents into one of the cars, it is run down the tramway to the face of a bluff 600 ft. distant. Here the car is automatically dumped into a chute leading to a railroad cut on a siding at the foot of the bluff. This outfit saves nine-tenths of the cost of hauling in carts from the shovel to the railroad.

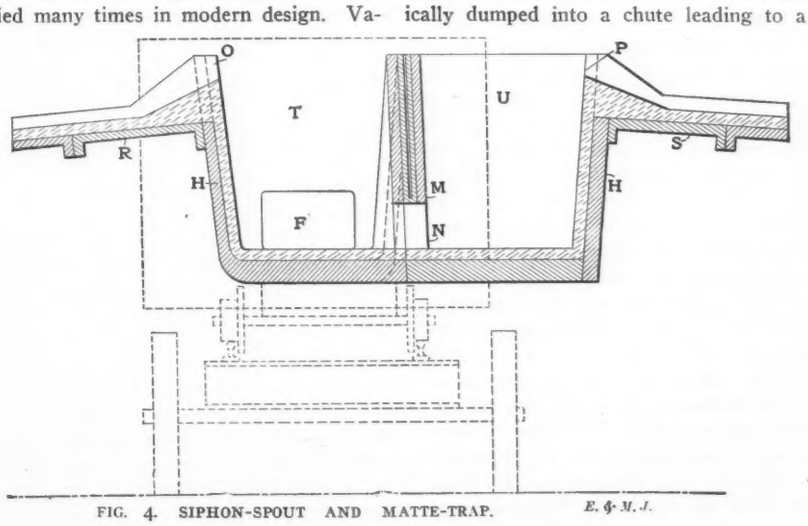


FIG. 4. SIPHON-SPOUT AND MATTE-TRAP.

Results of the New Mexican Mining Laws.

Señor Manuel Diaz Barriga, of the Financial Agency of the Mexican Government, has made the following statements concerning the results of the new mining laws of Mexico:

The taxes that were raised directly upon the production of precious metals were as follows: (1) The internal stamp tax, which represented 3% on the value of gold and silver; (2) the coinage tax, which was equal to 2% on the value of gold and silver; (3) the assay, smelting, separating, and refining taxes, according to various tariffs; (4) the title to mines tax, which consisted of a payment of $10 per pertenencia; (5) the local taxes on precious metals, the maximum of which was 2% on the value of the said metals.

In accordance with the new legislation, these taxes and dues have been subject to the following modifications: (1) The internal stamp tax has been fixed at 3½%, 2½%, and 1½%, according to whether the metals were in their natural state, or had been treated, or had been treated and refined; (2) the coinage tax has been abolished; (3) the title to mines tax has been reduced from $10 to $5 per pertenencia; (4) the annual tax has also been reduced from $10 to $6 per pertenencia, and in some instances to $3; (5) finally, the local taxes cannot exceed in future 1½%, and this reduction of 25% signifies a diminution equal to the respective Federal tax.

The Executive, desiring further to relieve the mining industry, freed from import duties the principal articles, coming from abroad, used in the mines or for the treatment of metals, although some of these exemptions are only of a temporary character. According to calculations made as regards the production of the last fiscal year, the reductions of the taxes and dues that have been decreed will cause a sacrifice to the Federal budget of close on $4,000,000 annually. This loss may be distributed in the following manner: Calculating on a production of gold and silver of $105,000,000 (of which $10,000,000 will pay 3½%, $80,000,000 2½%, and $15,000,000 1½%), the stamp tax will produce less than it produced in 1903-4 by $575,000; the amortization tax abolished, $1,550,000; the reduction of the title tax, $300,000; the reduction of the annual tax on partenencias, $725,000; the reduction of the Federal tax on the local taxes that are raised on mining $200,000. Calculating what the Government will lose by the abolishing of the import duties on certain articles used by the mining industry at $250,000, the resulting total is $3,600,000.

Coal Deposits of Neuquen, Argentina.

The *Standard* (Argentina) for Oct. 22, 1905, reports the formation of *Compañia Carbonifera de Chos-Malal,* whose object is the exploitation of the coal of Curileuvú, Tilhué, and Chacay-Melehue.

The land for which the concession has been granted is situated near Chos-Malal, in the Territory of Neuquen, within a quadrilateral formed by the Cordillera del Viento, on the west, the Neuquen river on the south, the Chacay-Melehue arroyo on the north, and the Curileuvú river on the east.

Argentina consumes annully 1,500,000 tons of coal, all of which is imported. Hitherto, though coal has been found in several places throughout the Republic, it has not proved to be of the necessary quality, either for producing steam or gas or for household use, nor have the beds been found to be of sufficient thickness to make the working of them commercially profitable.

The late director of the Mining Division of the Ministry of Agriculture, Mr. Hoskold, stated in a report some years ago, that coal existed in 50 square leagues of the region under consideration. Subsequently, an engineer surveyed the district by order of the Government, and in his report published in 1902, he stated that in consequence of a landslip on the barranca of the Curileuvú river, a seam of coal 2 m. in thickness had been disclosed.

The engineer detailed by the syndicate to examine the Curileuvú coal reported that it is found in a well-defined bed, in firm, parallel strata, composed of alternations of bituminous schist and of "ariscas" with carboniferous characteristics. The coal is of good quality. The cost of a ton of coal at the mine is estimated at $3.50 per ton, the cost of transport to Bahia Blanca, $4.54 per ton, making a total cost of $8.04 *moneda nacional* per ton, while a ton of Cardiff coal at the same port costs $13.64 per ton.

The necessary machinery has been purchased, it being intended to exploit the concession, in conjunction with the concession of José Ignacio Rios, for a railway from Bahia Blanca to the Antuco pass of the Cordillera, which will pass Chos-Malal and will thus provide for the transport of the company's coal.

Tin renders brass too hard. If tin is found in an analysis of brass chips it indicates that they were either made from sand castings (which always contain tin), or that they were contaminated with them. For making brass sand castings the tin does no harm.

A well-made maple pulley may be run with safety at a rim speed of 154 ft. per sec., which corresponds to 1.75 miles per minute.

Comparative Costs of Fuel.

We are indebted to the Automatic Gas Producer Company, New York, for the accompanying figures showing the comparative costs of fuel per horse-power-year for steam and gas engines under various conditions of operation and cost per unit of fuel. The figures are based on ten working hours per day and 300 working days per year, and the range of prices and consumption rates are such as to enable one to make very satisfactory comparisons.

STEAM ENGINE AND BOILER.

Coal per Horse-power Hour.	Cost per Horse-power Year.					
	3 lbs.	4 lbs.	5 lbs.	6 lbs.	7 lbs.	8 lbs.
Coal at $2.00 a ton	$9.00	$12.00	$15.00	$18.00	$21.00	$24.00
2.50 "	11.25	15.00	18.75	22.50	26.25	30.00
3.00 "	13.50	18.00	22.50	27.00	31.50	36.00
3.50 "	15.75	21.00	24.75	31.50	37.00	42.00
4.00 "	18.00	24.00	30.00	36.00	42.00	48.00
4.50 "	20.25	27.00	33.75	40.50	47.25	54.00
5.00 "	22.50	30.00	37.50	45.00	52.50	60.00

GAS ENGINE.

Using 20 cu. ft. of illuminating gas per horse-power hour:						
Cost per 1,000 cubic feet	$0.75	$0.80	$0.85	$0.90	$0.95	$1.00
Cost per horse-power year	45.00	48.00	51.00	54.00	57.00	60.00
Using 15 cu. ft. of natural gas per horse-power hour:						
Cost per 1,000 cubic feet	$0.16	$0.18	$0.20	$0.22	$0.24	$0.25
Cost per horse-power year	7.20	8.10	9.00	9.90	10.80	11.25
Using producer gas: 1¼ pounds of coal per horse-power hour:						
Cost of coal per ton	$2.00	$2.50	$3.00	$3.50	$4.00	$4.50	$5.00
Cost per horse-power year	3.34	4.17	5.00	5.83	6.67	7.50	8.33

GASOLENE ENGINE.

Using one pint of gasolene per horse-power hour:							
Cost per gallon	$0.08	$0.09	$0.10	$0.11	$0.12	$0.13	$0.15
Cost per horse-power year	30.00	33.75	37.50	41.25	45.00	48.75	56.25

Automatic Weighing of Coal.

Two years ago automatic coal scales were introduced in this country for weighing small coal passing into the mechanical stokers in the boiler house, as also for weighing the coal after it leaves the crusher on its way to the storage bin.

Henry Richardson, the inventor of this scale, states that he is about to secure patents in Washington for a later invention which will be applied to weighing run-of-mine coal.

It is expected that this new machinery, which will be constructed by the Richardson Scale Co., of New York, will handle run-of-mine coal in pieces up to 50 lb. in weight and of any dimension, in quantities of two tons per weighing and upward.

No difficulty is anticipated in handling quantities up to 500 tons per hour. Already there are in operation in New York and vicinity, scales for small coal of 250 tons capacity hourly.

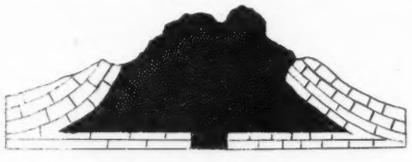
The purpose of the machine is to check colliery weights. There has always been a good deal of contention regarding the weighing of coal at the mines, and such a machine should be a valuable adjunct to the mine equipment.

The Little Rockies Mining District, Montana.

BY C. H. BOYNTON.

In the Kendall and Gilt Edge and Whiskey Gulch districts in Fergus County, Montana, mineral deposits of commercial value were but little known until a few years ago; now the largest output of gold from any one section in Montana comes from that county. The deposits are large and amenable to cyanide treatment, and, much of the mining being done in open pits, operation is cheap and the returns profitable. The mining industry has increased largely within the last three years and new discoveries are being made.

Another district which is now attracting attention is the Little Rockies, where several mines gave excellent results during the past year, although almost unknown two years ago, except by a few prospectors. Those conversant with the situation now predict that it will become



LACCOLITHIC FORMATION.
Black, porphyry. White, limestone.

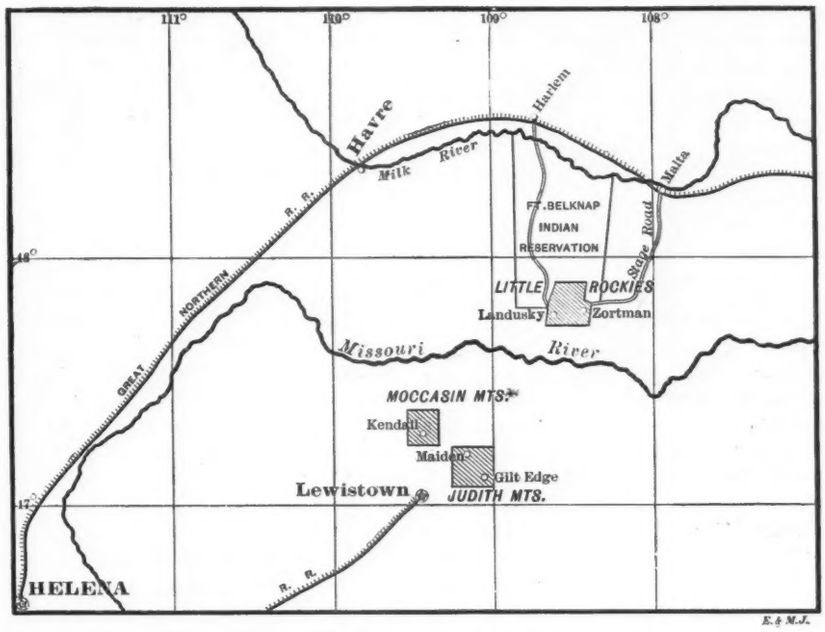
a rival of the famous Fergus county deposits.

The Little Rockies district covers an area about 12 miles square, in the eastern part of Choteau county, the extreme northern county of the State, and comprises the larger part of the Little Rocky Mountains. It is 50 miles south of the Great Northern railway and 25 miles north of the Missouri river, and can be reached by stage from Malta and also from Harlem. On the north, east and west the district is bounded by the Fort Belknap Indian reservation; this was set aside by the government for the Gros Ventres and Assinaboine Indians. The principal town is Zortman, on the east side of the mountains. Landusky, on the west side, is older, but most of the mining operation is nearer Zortman. About 125 men are now employed at the various mines and mills in the district.

Zortman and Landusky are at an elevation of about 3,000 ft. above the sea. The mountain peaks between the two towns have an elevation of 5,000 to 5,500 ft. Their north and west slopes are well timbered with pine and fir of good size. In the surrounding region, within 20 miles, are numerous beds of coal and in most of the gulches sufficient water for milling purposes is found. Streams flow in their channels across the porphyry, but sink on approaching the limestone and shales.

The geology appears to be the same as that of the Moccasin and Judith mountains in Fergus county, 100 miles further south. The center of the district and all the largest peaks are made up of an acid feldspar-porphyry with some intruded dikes of granite and sheets of gneiss. The sides of the mountains, lower down towards the plains country, are of limestone and shale, in all cases sloping and dipping away from the porphyry. This condition is thought to have been caused by a quaquaversal upheaval of the porphyry or more probably by a laccolite, as illustrated in the accompanying illustration, Fig. 1.

The ore bodies are large and strong and are found in deposits along the contact between the limestone and porphyry and in veins and replacement masses within the porphyry itself. Some of the ores



THE LITTLE ROCKIES MINING DISTRICT.

resemble those of Cripple Creek, Colo., and Mercur, Utah, and those of the Moccasin mountains, Kendall district, at Gilt Edge, Whiskey Gulch, Maiden and Spotted Horse in Fergus county, Montana. When found in the limestone near the contact with porphyry the ore is a brecciated and decomposed limestone, containing broken pieces of hard limestone colored by iron oxide, and by a purple mixture of fluorite and quartz. This is soft and easily mined and lies in lenticular masses along the contact, or in other instances, conforms to the formation and stratification of the limestone. This character of ore is the main supply of the district. Some of the largest ore bodies are, however, entirely within the porphyry along a series of fissures in it. In this case the ore is porphyry in which the feldspar has been replaced by quartz, the iron being oxidized near the surface and the porphyry is very much altered. Deeper down the ore is altered porphyry and quartz with a percentage of iron sulphide.

There is always more or less silver with the gold, but no free gold. Like the ores of the Kendall and Gilt Edge districts these are particularly adapted to treatment by cyanide processes, and there are two cyanide plants in operation at Zortman. One of these is the mill and plant of the Ruby Gulch Company, of 120 tons capacity; this during the past summer, sent to the assay office at Helena about $20,000 per month. This mill is being remodeled to give greater capacity. The mill and plant of the Alder gulch Company is of 100 tons capacity and during the past summer's run gave returns of about the same amount as the Ruby mill. Both these properties are being more thoroughly developed for operations in the coming spring. Another company, the Papoose Mining Company, will build a 300-ton mill and cyanide plant the present season.

The caustic alkalies, the alkaline earths, nitrates and cyanides, and especially the hydrates of barium and lithium, attack platinum at a red heat, although the alkaline carbonates have no effect at the highest temperatures. Sulphur, in the absence of alkalies, has no action, but phosphorus and arsenic attack platinum when heated with it.

In hot-galvanizing, refined spelter should be used if the galvanized metal is to be bent at all. A sheet of galvanized iron or a galvanized wire responds to bending in the same manner as sheet zinc. Iron galvanized with an impure spelter will crack when bent and the base metal is exposed. For galvanizing cast iron or similar classes of work, the cheapest grade of spelter is satisfactory.

Coal and Coke in Mexico.

In 1881 the Government, interested by the rumors of the existence of coal in various parts of the country, appointed a scientific commission with Santiago Ramirez as its chief, to investigate the facts as to coal in Mexico. The commission found coal of various qualities to exist mainly in the States of Sonora, Vera Cruz, Puebla, Oaxaca, Michoacan, and Guerrero. The Sonora field was declared to be a high-grade anthracite, carrying 92% of carbon. The result of the commission's report was an impetus to coal mining, but the costly transportation, together with the limited deposits and broken formation so far as then opened, disheartened the miners, and coal mining was nearly abandoned.

Some years later attention was attracted to the Esperanzas deposits in Coahuila, which led to the formation of the Mexican Coal and Coke Co., of New York, which owns and works them; in 1904 this company turned out 42,000 tons of coal and 6,000 tons of coke. The coal is bituminous, of coking quality, and an extensive coke plant at the mines supplies coke for smelting operations at several tributary centers.

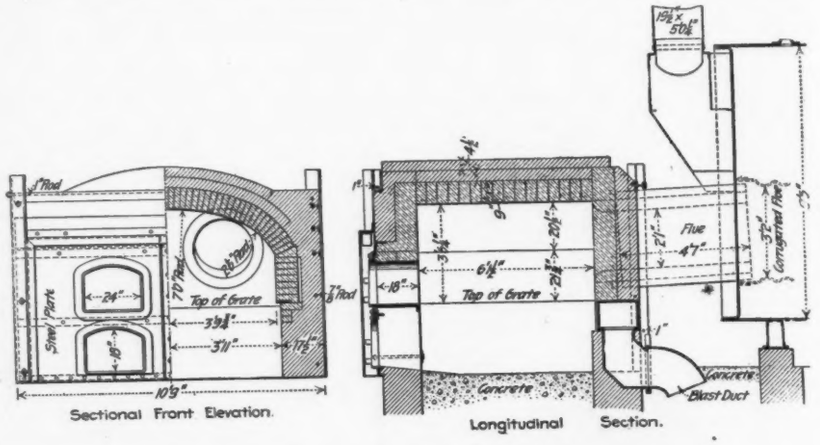
The principal coal mines now worked are along the line of the International Railway, and in the State of Coahuila, at Sabinas, Barroteran, Hondo, and Fuente. besides the Esperanzas before mentioned. Along the Rio Grande, westward from Porfirio Diaz, is an extensive lignite belt. The coal is of good quality, but it is practically unavailable now, because of the remoteness and wild nature of the country. The deposits of anthracite coal in Sonora have attracted much attention, and several companies have been organized to exploit them, but no actual mining is yet being done because of the lack of railway transportation. Anthracite coal is also found in the Matamoros de Izucar district of Puebla, but has not yet been systematically mined.

The Mexican Coal and Coke Co., recently arranged with the International Railroad Company for the exchange of the railroad of the former, from Barroteran to Musquiz, for the coal fields of the latter. The deal was to go into effect about Jan. 1, 1906. Through this transaction the Mexican Coal and Coke Co., obtains the coal mines of the International at Sabinas as well as those near Porfirio Diaz.

From $30 to $35 per troy oz. is frequently charged for palladium foil. Platinum sells for about $21 per troy oz. in the same shape. It is probable, however, that in large amounts palladium can be purchased at a moderate advance over that of platinum.

Furnace for Burning Coke-Breeze.

At the new works of the Milwaukee Gas Light Company, Milwaukee, Wis., the use of gas engines is one of the features of the plant. The air compressors are steam-driven, however, and five 200 h. p. Scotch boilers are installed for furnishing the steam. Coke breeze is used as fuel; this is burned in firebrick furnaces under forced draft. The furnaces are of special design and are shown in the illustration



FURNACE FOR BURNING COKE-BREEZE.

which we take from *Engineering News* (Jan. 11, 1906, p. 28). They are fitted with White hollow grate-bars, with curved top-surfaces, the air escaping through slots across the tops of the bars. Short flues lead from the furnaces to the boilers, and the smoke flues lead to a brick chimney 125 ft. high and 5 ft. 6 in. inside diameter.

The Development of the Steam Engine.

A writer in the *Mechanical Engineer*, speaking of the development of the steam engine, says: "Watt's invention was fundamental; not a mere detail improvement. His engine possessed practically all the main principles common to modern engines. He used steam expansively, jacketed his cylinders, had a separate condenser and air-pump and controlled the speed by his well-known governor. . . . By comparison engineers appear since his day to have been asleep, except for short occasions. . . . Where, then, have been the improvements during the last 150 years? The answer is: Increased steam pressures; steam used more expansively; division of the expansion, and variation in temperatures between two or more cylinders; greater accuracy with which parts can now be finished; quicker speeds at which engines can now be run. . . . It is very difficult to say to what extent steam pressures will advance in the near future, but superheating will undoubtedly become general.

Gem Production in Brazil.

According to the *Bulletin* of the Bureau of the American Republics, great development has taken place in gem production in Brazil. Exploration in Minas Geraes has led to discoveries of tourmaline, which have furnished magnificent rubellites (red variety of tourmaline) as well as blue-green, and green gems; large quantities were found, cut, and sold during 1904. Further discoveries of gem beryls in the same State have furnished magnificent blue and green aquamarines, which have been cut and have reached the gem markets of the world.

A large quantity of Brazilian amethyst has come from the great geode, the bulk of which was shown at the Dusseldorf Exposition in 1902. Many of these which were obtained from the points of the myriads of crystals that lined the great grotto were, on account of their rich, dark color, sold as Siberian amethyst.

The State of Matto Grosso has recently granted several concessions for the exploitation by means of drags of the beds of numerous streams, which are thought to contain gold or diamonds, or both, in sufficiently large quantities to make it remunerative.

One of the concessions belongs to an English company, the Matto Grosso Dredging Co., which has already taken out some gold and several diamonds from the Rio Coxipo de Ouro and is preparing to explore the Rio Manso.

Another concession has been transferred to the Eastern Matto Grosso Co., organized at Buenos Ayres. This embraces the bed and banks of the Rio Coxipo and Rio Jauro for an extent of about 340 km.

Nuts should never be made up tighter than is necessary to accomplish the desired result. The sense of "feel" is the only guide.

The oxidation of sulphides in dry air is destructive of puzzolan cement, mortars, and concretes so exposed.

Fluid-Motive-Power Pump.

Henry T. Farnsworth has patented (U. S. Pat. 761,366; May 31, 1904) an hydraulic pump or ram in which the fluid actuating the device is kept separate from that which it is desired to pump.

The action of the device is practically the same as that of the ordinary hydraulic ram, with the distinction that the ram or plunger used, instead of acting solely as a valve, is made in the form of a piston.

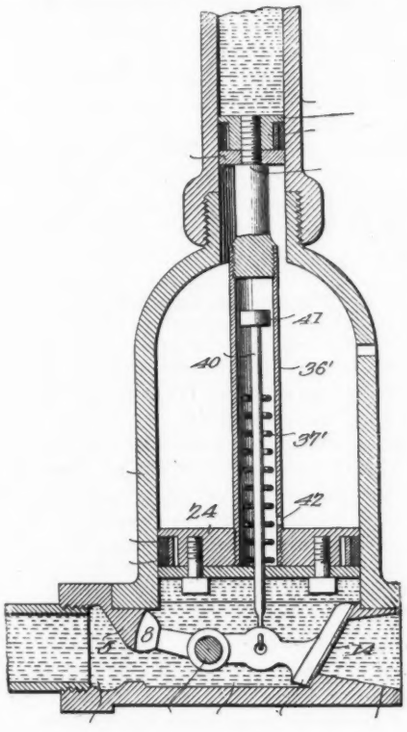


FIG. I.

This latter, by the pressure of the motive fluid, is set in motion; and by alternate reciprocations, communicated through a connecting rod, operates the piston of an ordinary pump of lower capacity.

The illustration (Fig. 1) shows the essential characteristics of the device; the lower body of water is that actuating the mechanism, and that shown above is the medium to be pumped.

Transportation of Natural Gas.

At the close of 1904 there were 156,456,370 ft. or 29,632 miles of mains for the transportation of natural gas in the United States, which varied from 2 to 36 in. in diameter. The greater portion of the pipe in use is 8 and 10 in. in diameter. The line pressure on the smaller pipe up to 10 in. runs as high as 400 lb.; for 20 in. diameter the pressure is usually less than 300 lb. to the square inch. Originally the gas pressure in the wells was sufficient to transport large quantities in ordinary-sized pipes to points of consumption many miles distant. In many instances during recent years the gradual falling off of the natural pressure has made it necessary to instal powerful pumping or compressing machinery.

By far the most economical results have been secured by large gas-engine compressors, in which natural gas is exploded instead of steam being used, and in which 9 cu. ft. have developed 1 h.p. per hour, while working at about 1,500 h.p. capacity. Thirty cubic feet of gas have been compressed from 0 to 270 lb. pressure to the square inch by the consumption of 1 cu. ft. of natural gas, whereas double that amount of gas is consumed under boilers supplying double-expansion condensing steam engines to do the same work.

In recent years there has developed a general extension of many of the large lines, supplying central western Pennsylvania and northeastern Ohio, into the deep and prolific fields of southwestern Pennsylvania and western West Virginia, which are now operated in a most economical way, enforced by the dearly learned lessons of the reckless exhaustion of the original fields of Pennsylvania, Ohio, and Indiana. Much larger lines have been recently constructed, and the increase in diameter has added largely to their capacity and has increased the quantity of gas delivered at points of consumption.

Metallurgy of Antimony.

Much inventiveness has been shown in the extraction of antimony from its ores or impure bullion, by leaching processes. Betts recommends the use of acid ferric chloride as a solvent for stibnite or crude antimony, with electrolytic deposition of the antimony, using carbon anodes and copper or lead cathodes. In general he prefers antimony trifluoride to the usual trichloride in electrolysis, especially when elimination of copper is desired.

J. S. MacArthur proposes to treat ore containing antimony, ground to 20-mesh, with a solution of sodium hydroxide, of not more than 2% strength, unless the ore contains oxide of antimony, at a temperature of 100° C. The filtered solution is precipitated by carbon dioxide obtained from a lime kiln, the reaction being assisted by cooling. The precipitate is collected in a filter-press, and the filtrate, containing sodium carbonate, is causticized by lime for further use, thus forming a cyclic process.

S. Metzel proposes to prepare antimony oxide from crude sulplide by warming the powdered ore with sulphuric acid in the presence of sodium or potassium sulphate. A crystalline double sulphate of antimony and the alkali-metal separates on cooling; on boiling this with water, it is decomposed and the antimony oxide is left, releasing the acid, which is used over again.

The treatment of antimony ores containing gold, for recovery of the gold, presents a promising field for investigation.

A New Mining Transit.

The accompanying engraving shows a five-inch limb transit for mine surveying, fitted with interchangeable top and side telescope of the Dunbar D. Scott design, as made by Wm. Ainsworth & Sons, of Denver, Colo. It is provided with a five-inch full vertical circle, stadia wires, gradienter, variation plate, limb verniers, and extension tripod.

Among the improvements embodied in this instrument may be mentioned the ribbing of the variation plate, which has been extended nearer the outside of the plate, producing a more rigid plate with the same

amount of metal. The inside of the telescope tubes and the outside of the drawtubes on both main and auxiliary telescopes, after being turned to size, are lapped on a machine specially constructed for this purpose. The spindle and socket are made of hard bronze alloys; they are of different compositions in order that friction may be eliminated to the greatest extent possible, and are finished by lapping.

Manganese in Brazil.

The Morro da Mina Manganese Co. lately published its second report, being for the year ending June 30, 1905. The total quantity of manganese ore quarried by the company during the year was 65,753 tons, and the quantity exported was 78,067 tons, as against 86,032 tons extracted and 66,362 tons exported during the previous year.

When phosphor-tin is mentioned and no percentage is given, the 5% material is usually supposed to be meant. It is always advisable on this account to state the percentage of the phosphorus which is contained in the phosphor-tin when any mixture is given containing it.

Electric Motors in Mining.*

BY W. EDGAR REED.

The increasing application of the electric motor to mining machinery is due first, to the economy resulting from centralizing the power generating stations instead of using isolated steam boiler and engine plants or long lines of piping which are sometimes difficult to put in a safe and convenient place, together with the advantage which can frequently be taken of cheap power from waterfalls; second, to the ease of control and the economy and facility of electric transmission for motors applied to hauling, winding, drilling, cutting, rock-breaking machinery, water pumps, ventilators and fans.

Either continuous or alternating-current motors are suitable for driving mining machinery and the kind used will depend upon the cost of power at the mine rather than the characteristics of the motor. In general, if the power is to be transmitted any distance, alternating current would be used, while, if it were not necessary to transmit the power, local conditions would determine which kind of motor to use. As there is no sparking of any kind in the short-circuited rotor induction motor, it is considered the best suited for use in mines where explosive dust or gases are found. It also is the simplest, requires the least attention, can be started from a distance, and can be used in places inaccessible for frequent inspection. Continuous or alternating-current commutator-type motors should be entirely enclosed when used where there are explosive mixtures, to prevent ignition of the gases by sparks at the brushes. When motors are entirely enclosed, a larger motor must be used for the same rating, or an air blast or other means used for keeping the motor cool if the same size frame is used.

Electric locomotives have proved economical in mine haulage and their application to this work, especially when the grades are not exceedingly heavy, is constantly increasing. The control is simple and easy and they are made for low and narrow entries. The variable-speed motor is best suited for this class of work and the series-wound continuous-current motor has been used more often than the other types, although the single-phase alternating-current motor will surely receive its share of future applications.

For very heavy grades, electrically-driven drums are now frequently used for hauling and hoisting instead of locomotives. If an endless rope system is used, the drums being driven continuously in one direction, a constant-speed or compound motor should be used, depending upon the starting torque and amount of load thrown on at any time. If reversing drums are used, a variable-speed or compound motor should be used, depending upon the starting conditions and length of runs. The series motor should not be used if the load at any time will be small enough to allow the speed to become too great. Both alternating-and continuous-current motors of the types mentioned above have been used for hoisting and haulage. There are also many special systems of hauling and hoisting which depend upon the layout of the installation and are too numerous to be taken up here.

Both alternating-and continuous-current motors are also used in mines for driving centrifugal and direct-acting water pumps, air compressors, ventilators, fans, coal-cutting machinery, etc. Constant speed motors should generally be used for continuous running fans, and either these or the compound type of motors for intermittent running fans. For triplex pumps or pumps which require very nearly constant torque during the entire revolution, constant-speed or compound motors are applicable. For single cylinder pumps which require varying torques during a revolution the compound wound motors should be used to keep down the fluctuations in current. A great saving in starting current can be made where motors are required to start up under a pumping head if a by-pass is used for the water until the motor is up to speed. The by-pass should then be closed slowly so as to load up the motor gradually. The insulation of all motors for mine work should be moisture and water-proof.

The electric motor is also used advantageously in placer mining for pumping, hoisting and dredging machinery, conveyors, and bucket lines.

*Part of a paper in the *Proceedings* of the Engineers' Society of Western Pennsylvania, Oct., 1905.

Efficiency of Worm Gearing.*

BY H. SOMACH.

Worm gearing possesses the great advantage that a high degree of reduction in speed can be obtained with a single worm and wheel, whereas, if spur gearing, ropes or belts were employed, a multiplicity of moving parts is inevitable unless the degree of reduction be small. The excessive loss due to friction in worm gears has frequently been spoken of, but with properly designed gearing the efficiency is by no means low. The efficiency of a worm drive operated by an electric motor of 40 h.p., averaged about 90%, when working at 1/5 load and upward, and was singularly constant. The wear in this gearing after years of work was found to be inappreciable.

Hitherto, when worm gearing has been adopted for tram-cars the motor has been supported directly by the axle, and, owing to the shocks caused by the unevenness of the road, trouble has frequently been experienced and spur gearing has then sometimes been substituted for the worm. The Oerlikon Company has recently made a new departure by attaching the motor to the framing of the bogey, the springs thus intervening between it and the road wheels. The coupling with the worm is then effected by a pair of universal joints. The worm is triple-threaded and has a pitch of 120 mm. (4.7 in.); it is made of hardened steel, the teeth of the wheel being of phosphor bronze. The reduction in speed is 1:12. The power on each car is derived from two motors running at 1,200 r.p.m., and weighing 300 kg. (660 lb.) each. If transmission by single spur gear were adopted the motors would run at 500 r.p.m., and each would weigh 650 kg. (1,430 lb.).

*Abstract from an article in *Le Génie Civil*, XLVI. 303-304.

The Dessau Gas Retort.

The Dessau vertical gas-making retorts are operated on the unit system. Each furnace set or bench contains ten retorts, 13 ft. in height, which are heated by a gas producer placed centrally alongside of them. On either side of the producer are regenerators, and the temperature of the flame (made to travel backward and forward past the retorts by means of baffle-plates) is 1,400°. The gas-producer is of sufficient size to hold a charge of coke to last for 24 hours. Each retort takes a charge of from 1,100 to 1,210 lb. of coal, which, according to quality, may need from 8 to 10 hours to gasify. The volume of gas made by each retort in 24 hours is 14,125 cu. ft., or from 11,140 to 11,860 cu. ft. per ton of coal, according to quality. The illuminating power of the gas is much superior to that made from similar coal in the horizontal retorts, while the yield in coke is considerably greater and of better quality. It is stated that the tar made by the new process is more valuable than that formerly obtained when using horizontal retorts; the gas, moreover, has 50% less naphthalene than before.

Phosphor-tin is very active in removing iron in brass or bronze. It frequently happens that a small quantity of iron will find its way into metal in spite of the fact that it has gone through the magnet machine. This iron does much harm if it exists as uncombined metal (*i. e.*, in small grains or pieces), but if it is made to combine with the brass or bronze little harm usually results. The metal is made slightly harder, but to so small an extent that it is unimportant.

Puzzolan is usually very finely ground, and when not treated with soda sets more slowly than Portland cement. It stands storage well. Cements treated with soda to quicken setting become slow setting after long storage from the carbonization of the soda (as well as the lime) element.

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*Illustrated.

It is to be regretted that the local statisticians of the West do not report the output of *zinc ore* instead of the estimated zinc content of the ore produced, calculated at the New York price of spelter. This is not only misleading as to the commercial magnitude of the thriving new industry, but also affords comparatively little information of commercial value.

Fears are expressed that the unusually mild winter, which is being experienced in a large part of this country, will have an unfavorable effect upon the crops of this year. This is indeed a very long-range forecast, but it is doubtless a fact that weather so utterly abnormal has an important effect upon the condition of the soil, and is consequently likely to influence the results of agriculture.

The prospective new consolidations in the mining and smelting business, which have been much discussed during the last fortnight, are reminiscent of the great flotations and underwritings of five and six years ago. There is a difference, however, in the attitude of the speculative public, which is not yet quite so much in evidence as it was then and is rather wary of suspected efforts to unload.

The Drought in California.

The long and disastrous drought in California has been broken by a "record" rainstorms, lasting many days and extending throughout the valley and mountain regions of the State from one end to the other. The rivers have all risen very rapidly and some of them overflowed their banks, more or less damage having been done in the loss of bridges, etc. There were three separate storms following one another at brief intervals and each bringing a heavy downpour.

The result of these storms has been that the reservoirs have been filled, the creeks, ravines and ditches are running full, the power plants have been started up and the mines of the State are again in operation, after long idleness for lack of water. Some of the quartz mills in the mining regions have not dropped a stamp for over three months, and all the larger mines have been unproductive for many weeks. The hydraulic miners, who have been waiting a long time, now have an abundant supply of water, and being in readiness have all started piping. There is a heavy fall of snow in the mountains, which should ensure a good water season this year for all classes of mining.

This is of course a great relief to the mining industry of the State, which suffered severely from the drought, as the statistics of gold production in 1905 proved emphatically. The experience has stimulated consideration of ways and means to avoid a similar predicament in the future, which although expensive will doubtless prove economical. Some of the larger companies, especially the Empire and North Star at Grass Valley, are already arranging to be in a position to keep the mines going in the future without regard to water conditions, equipping them to work with either water or electricity. The electrical plants for all departments will be kept in readiness for instant use in case the water supply gives out.

Mine Accidents in Great Britain.

The preliminary report of the fatal accidents in mines in the United Kingdom in 1905 has been promptly issued, as usual. It shows that during the year there were 955 fatal accidents in coal mines, 41 in metal mines, and 94 in quarries; a total of 1,090. The number of persons killed compares with the record of the previous year as follows:

Class of Mines.	1904.	1905.	Changes
Coal mines.....	1,055	1,150	I. 95
Metal mines	35	44	I. 9
Quarries.....	112	96	D. 17
Total.....	1,202	1,290	I. 88

The number of deaths has been steadily decreasing for some time, until last year brought a change. In most of the accidents only one person was killed. The important exception is found in explosions of firedamp or coal dust. In this class, 178 persons were killed in 14 accidents, an average of 12.7 to each.

The causes of the deaths reported are classified as follows:

Cause.	Coal.	Metal.	Quar.	Total.
Explosions of fire damp or coal dust.....	178	..	..	178
Falls of ground.....	510	21	32	563
Shaft accidents.....	65	9	..	74
Blasting.....	20	4	13	37
Miscellaneous.....	252	7	37	296
Total underground...	1,025	41	82	1,148
Surface	125	3	14	142
Total.....	1,150	44	96	1,290

As usual, falls of ground were the most important cause of accident and death, 43.6% of the fatalities being due to that cause, while only 13.8% were caused by gas or dust explosions. Of the total number of deaths, 89% were underground, or

in quarries, while 11% were on the surface.

This preliminary report does not give the number of persons employed; so that the ratio of deaths cannot be determined until the full report is published, at a later date.

Zinc Smelting in Silesia.

We have repeatedly called attention to the change which the zinc smelting practice has been undergoing during the last 15 years, and have predicted the time when the historic Silesian method would become obsolete. Judging from the statistics for 1905, which are published elsewhere in this issue, that time is not far distant, the Rhenish furnace having already attained a remarkable extension in its application. The new works erected in Upper Silesia are invariably equipped with that type of furnace, while the established works remodel their old furnaces at every opportunity. The prime cause for this departure in practice is the change in character and the increase in the average grade of the ore furnished by the mines, which is due to the exhaustion of the comparatively low-grade calamines and the increasing output of the sulphide ore, much richer in zinc.

Roasted blende is, of course, smelted more advantageously in small muffles than in large ones; in realizing the necessity for a change in their practice the Silesan smelters naturally turned to the Rhenish furnace, which has proved so successful in Rheinland and Westphalia, and from there has forced its way into Belgium and America as well as into Silesia. The Rhenish furnace itself is a modification developed by a combination of the best features of the original Belgian and Silesian types of furnace, dating from about 50 years ago ,when the Silesian practice had a great influence upon that of the west of Europe. The changes which then emanated from Silesia are now reflected back to their source.

Zinc smelting was begun in Silesia in 1798; it was begun in Carinthia about the same time; but the art was not discovered in Belgium until 1807. It had been carried on in England, however, since 1740, and it is believed that the process employed there was introduced from China. So far as the historical evidence goes, these discoveries were independent. At all events, a radically different type of furnace was devised in each case. Of these, the Carinthian was the most inefficient, and after about 30 years it passed out of use, which never had been extensive. The English furnace survived, with diminishing use, until about 1860.

The Silesian furnace was evolved from a glass-melting process with which Johann Ruhberg made his first experiment, and the type has ever since retained certain of the original characteristics. After its introduction in the west of Europe, the single tier of large muffles was replaced by the two or three tiers of smaller muffles, which developed into the Rhenish furnace. This did not, however, establish itself in Silesia until recently. The Guidottohütte, built in 1891, was equipped with furnaces having two rows of small muffles, but they did not prove successful, and were rebuilt. In 1893 a similar furnace was tried at the Hohenlohehütte with more promising results. In 1898 the Rhenish furnace was introduced at Antonienhütte, where the charge smelted consisted of 70 per cent. roasted blende and 30 per cent. calamine, and since then the change to the new type has been rapid.

This change is of great commercial importance. The mines of Upper Silesia contained what were probably the largest deposits of calamine that have been known. The deposits of blende, below the line of oxidation, are believed to be even more extensive. The blende assays higher in zinc than the calamine, wherefore, in producing the same tonnage of ore the quantity of zinc afforded is considerably increased. The quantity of zinc extractable is further increased by the adoption of the new method of smelting, whereby the percentage of loss is reduced. As a matter of fact, the tonnage of ore produced by the mines is increasing year by year, so that taking all the factors into consideration the large and steady increase in the spelter output of Silesia is readily explained. The chief limiting factor appears to be the legal requirement that the gases from the roasting furnaces shall be taken care of, which means practically the manufacture of sulphuric acid, and that is scarcely a profitable by-product under the existing conditions.

Observation and Deduction.

Great inventions are apt to appear very simple after they have been described. It is indeed generally the fact that because they are simple they are great. The simple improvement finds immediate application and may return great profit chiefly because it is simple, whereas the complex requires extraordinary effort to force conviction upon the minds of capitalists and is likely to afford comparatively small returns because of the cost. A story is told of a famous inventor, who had rejection after rejection of his applications for patents on the ground that they were no inventions—they were so obvious. One day his solicitor found him in a brown study in his experimental machine shop. "I wish that B (the examiner) were here to show me the obvious solution of this thing," said he; "of course, it would be simple to him, but I can't see it." Many things look easier after they have been pointed out, than they did before. We are apt to say of some new thing that has proved valuable. "Why, anyone would have thought of that!" But no one did think of it until the inventor showed how it could be done.

So it is that we owe much of our material progress to the theoretical and practical knowledge, the keenness of observation and the power of deduction of some students of the arts and sciences. One metallurgist knew that certain minerals, commonly supposed to be insusceptible to magnetism, possessed in fact a magnetic permeability, although to a very low degree, observed that this property was affected by their chemical composition, deduced the theory that they could be separated by magnets of high intensity, and evolved a process which has developed the usefulness of a large class of ores that were formerly worthless. Another metallurgist observed that the gas bubbles produced when certain ores were introduced into a bath of dilute acid caused some of their constituents to float to the surface, while others would not, thus affording a mean of separation which has become of great commercial importance. Still another metallurgist, eminent in cyanide practice, being confronted with the problem of a slime that would not settle, observed that a drop of the liquor flattened out with apparent lack of surface tension, conceived that the liquor contained some substance which altered its physical properties, added a small quantity of sulphuric acid to it, and immediately obtained a rapid and perfect settlement; the explanation of the phenomenon is still obscure, but the invention put the mill immediately on a paying basis.

The development of the ingenious and

efficient system of controlling fires in sulphide mines, invented and introduced by Mr. Lewis T. Wright, which he describes in a valuable paper published elsewhere in this issue, is another example of the application of theory, observation and reasoning to the solution of a difficult problem. It is to be regretted that the credit for this successful system, which is entirely due to him, has been erroneously attributed to another individual, whose claims to what does not belong to him have received an acceptance to which they are not entitled. The major part of Mr. Wright's article was originally presented in an address to the students of mining and metallurgy of the University of California, in which he took as his text the value of theoretical knowledge, especially a sound training in mathematics, chemistry and physics; the necessity for observation; and the application of reasoning to the data observed. "The best way of solving any given problem," said he, "is first to understand very clearly the precise nature of the question. The evidence may be vague, confused, and fragmentary. Very small changes in working conditions, or in the nature of the materials worked with, may produce great and seriously inconvenient changes in economical results. Some small influence working at the short arm of a lever may be producing a very great movement at its other end. If you can discover what it is that produces this small influence, you may be able remove it from your operation, or counteract it, or even utilize it in some way to the benefit of the process you are carrying on." His own successful practice at the Iron Mountain mine has been a satisfactory exposition of the value of these principles.

Economy in Use of Coal.

The tests which are being carried out at the coal-testing plant at St. Louis, under the direction of the U. S. Geological Survey are directly designed to increase the knowledge as to the character and utilization of our coals, and especially the means which may be introduced to effect economy in their use. This is an important investigation, inasmuch as there is probably no one of our important resources which we treat more wastefully, and no one in connection with which is so collossal a saving possible of consummation. In comparison with the vista opened by the increase in the efficiency of coal consumed for power generation promised by the gas engine, the economy that can be realized in the manufacture of coke, and the spectacular saving in the use of coke in smelting that may result from Gayley's invention, the savings that we think of attaining in our other metallurgical processes sink almost to insignificance. The United States alone produces upward of 350,000,000 tons of coal per annum, worth at the mines an average of about $1.35 per ton; when delivered to the points of consumption perhaps $2 per ton. This huge quantity of coal is to a very large extent burned with a low degree of efficiency. For example, in the best steam practice only about 15% of its energy is utilized; this is doubled by the gas engine. Similarly, the use of gas firing and regenerative furnaces in connection with industrial heating may halve the coal consumption. Reckoning that one half of our present coal consumption might be effected with double economy over the present practice, the saving would run close to $100,000,000, a figure which startles the imagination.

We are prompted to these remarks by the receipt of Bulletin No. 2 of the Iowa Geological Survey, which contains a report on the tests of Iowa coals at the St. Louis plant and follows the above line of reasoning. A sample of Iowa coal was found to yield 2.86 times as much energy when converted into gas and the gas burned in a gas engine as when the coal was fired directly under a boiler. The report concludes as follows:

"The above results have great economic significance. Probably more than three-fourths of the coal mined in Iowa is used for the generation of power. This would make 4,880,740 tons of coal consumed in power production out of the total of 6,507,655 tons mined in Iowa during 1904. Disregarding the difference in the cost of installation and operation of machinery, and with the very conservative estimate of 50 per cent gain in efficiency of coal by means of the gas producer and gas engine above that of the boiler and steam engine, the saving by the former method would be equal to 2,440,370 tons of coal. This at $1.60 per ton, which was the average price at the mines of Iowa coal in 1904, would be equivalent to an annual saving to the people of the State of $3,904,592."

This line of reasoning is, however, quite fallacious and will do much to discredit the results obtained at St. Louis, when the business men to whom such promises are held out discover that they are not at present capable of realization. In a consideration of this character the difference in the first cost, operation and amortization of the several types of installation must not lightly be disregarded. Engineers are well aware that the gas engine attains double the efficiency of the steam engine, and in this respect the St. Louis tests tell them nothing new. They are aware, moreover, of what the tests say nothing about, namely that the costs of the gas-engine installations are so much higher all around, that when reduced to dollars and cents the apparent economy practically disappears. It is highly debatable whether at the present time the gas engine or the steam turbine is ahead. Similarly, it frequently does not pay to substitute regenerative furnaces for direct firing, because of the increased costs of installation, operation and amortization, although the economy in fuel may be 50 per cent. In any case the decision depends largely upon the unit cost of the fuel, which has so obvious a bearing on the question that it need not be discussed.

These questions fall entirely within the province of the engineer; the chemist and geologist are the last men to whom their analysis would be entrusted, and when they voluntarily enter upon them misconceptions are sure to result. It is not, anyway, the function of either the national or the state geological surveys to go this length. It is far from our intention to criticize the scheme or organization of the Government Coal Testing Plant. It will, we are sure, achieve a high degree of us fulness. The most important result in our opinion will be the education of the public to the fact that great economy in coal is possible, and will thereby direct attention to the simple methods for effecting it to some degree, as to which many engineers can advise, *e. g.*, the installation of more efficient fire-places in connection with steam boilers, more intelligent management of the fires, etc. Moreover, much important data will be obtained as to the composition and calorific value of numerous coals, and much important information as to the behavior of certain coals in the washery, in the briqueting plant, in the coke oven and in the gas producer, all of which will be valuable to the engineer. It is the engineer, however, who will be relied upon for the final deductions.

Metallics.

Water should not be allowed to stand in hose after using. This applies especially to cotton hose.

For railway car bearings an alloy of copper 75%, tin 22%, and zinc 8% is some times employed.

The steamer *Joseph Butler* recently was loaded with over 10,000 tons of coal in 17 hours 20 min. at Ashtabula, Ohio.

Steam turbines of the Parson's type are now developing over 1,000,000 h. p. in the cities of Europe and the United States.

Bronzes for bearings vary in composition from 81 to 87% copper and 19 to 13% tin, the lower copper content giving the harder bronze.

In 1862, a 16-inch gas main was laid in Chicago with cement joints. So far as known, this is one of the few installations that has not given trouble through leakage.

Bearings that are unsymmetrical are found to wear unevenly, and to be more apt to heat than those which are symmetrical. This is especially true in locomotive practice.

Bronzes other than as used in art metal work, are employed for two different classes of service; either to resist friction, as in bearings, or to resist other stresses, as in gear wheels, and the like.

Reinforced-concrete buildings, when founded upon yielding soil, should have a flexible wall construction. Lime-paste, added to the mixture, will impart elasticity to it to a certain extent, but it weakens the concrete.

It has been suggested that feldspathic rocks, by fine grinding and with the possible addition of limestone, gypsum, or ammonium salts, could be used as fertilizers; this is due to the quicker availability of the potash after this treatment.

Animal charcoal is the best thing to remove greasy substances from glass vessels. Pour a little alcohol into the vessel, moisten the inner surfaces by shaking or swinging, put in the animal charcoal and then add water and shake thoroughly.

Pure hydrogen gas, containing about 2% of oxygen, has been prepared by the electrolytic decomposition of water, and this gas, compressed in cylinders to pressures of from 1,500 to 2,000 lb. per sq. in., has been found convenient for shipment by rail.

A trommel 48 in. diam. and 6 ft. long, with four 2-in. bands has an effective screening surface of 67 sq. ft. The effective screening surface of a trommel 42 in.x6 ft. is 58.7 sq. ft., of a trommel 36 in.x6 ft. it is 50.24 sq. ft., of a trommel 54 in.x6 ft. it is 74 sq. ft.

Fine sand or gravel should be avoided in concrete mixtures. Coarse sand gives the greatest strength, but when the proportion is greater than 1:2 a sand of mixed grains with the coarse predominating, is preferable; fine sand helps to fill the voids in the coarse sand and enables less cement to be used for the same effect.

Footings for the walls of buildings should be 12 in. wider than the wall, except in case of an 8-in. wall, when the footing need be only 16 in. wide. The outside of the work should be laid as headers, and no course should project more than one-fourth brick. The bottom course should always be a double one.

Fusible links, where used for controlling fire doors and the like, should be set in such a position that they are not close against the door or its frame. A good circulation of air around them is necessary, in order that they may not be "pocketed" and, consequently, subjected to a lower temperature than may exist in the rest of the building or room.

In coursed-rubble masonry, at least one-fourth part of the face in each course should consist of bond stones or headers; each header to be of the entire depth of the course, of a breadth ranging from 1½ to double that depth, and of a length extending into the building to from three to five times that depth, as in ashlar. No side-joints should have an angle with a bed-joint sharper than 60°.

Rolls receiving up to 1.25 in. cube should be run with a peripheral speed of 350 to 400 ft. per minute; rolls receiving up to 0.25 cube should run at 550 to 600 ft. per minute; rolls receiving up to 14 mesh should run at 700 to 750 ft. per minute; rolls receiving material from 15 to 20 mesh for reduction to 40 mesh can be driven at speed of 1000 ft. per minute and over, but speeds of much more than 1000 ft. per minute are not to be recommended.

Silica graphite paint weighs 9.75 lb. per gallon, and has a covering power of 500 to 600 sq. ft. per gal. for an even coat on metal surfaces, and about 350 sq. ft. per gal. on wood. The smoothness of the pigment saves materially in cost of labor and brushes in applying. The cost of the paint, ready mixed for use, is about $120 per barrel of 50 gal. At this rate the cost per sq. ft. is about 26c. for metal and 37c. for wood surfaces.

Many tests go to show that painted canvas is less combustible than the unpainted fabric. The heavier the coat of pigment, the more the flame is retarded. In the case of burning vessels, the canvas-covered decks which are often coated with a thick layer of paint, are seldom destroyed by fire, except from beneath. Even here, the wood will often be charred to the point of disintegration, and yet be held together by the painted canvas covering.

For fine crushing, massive and well-built rolls are a prime requisite. The journals should be outside of dust-proof housings, well-protected against dust and grit, and amply provided for thorough lubrication. For 26x15 in. rolls the shaft should be not less than 7 in. in diameter in the journals, and the boxes should be of the ball-and-socket variety, the whole figured for a steady working pressure of 15 tons on each side and capable of standing up under double this pressure for intervals.

The asbestos curtain as used in theatres is usually made from a heavy asbestos cloth, woven from the long fibres. The stronger fabric is made with fibre and fine copper or brass wire, interwoven. "Carded fibre," as the purer sort is called, is not often used for this purpose, on account of the high cost; its application is found in the laboratory, where it is used for filtering and like chemical operations. The minute particles of iron that are present in the uncarded fiber, are removed, and the resulting product is the purest form of asbestos known in the trade.

The *Amethyst* and the *Topaz*, British torpedo-boat destroyers, were constructed after the same pattern, and selected by the Admiralty for the purpose of making a series of exhaustive tests; the former was equipped with turbines and the latter with reciprocating engines. The contract speed of the vessels was 21¾ knots and the tests showed that at all speeds above 14½ knots the turbine-equipped *Amethyst* was more economical, namely, 15% at 18 knots, 31% at 20½ knots and 36% at 21 1-10 knots. At full power in each vessel the *Amethyst* showed 42% more than required by contract on the coal allowed. The *Amethyst* also reached a speed of 23.5 knots during these tests and the *Topaz* only 22.1 knots.

Lightning rods on brick chimneys should invariably be bonded to establish electrical connection with the cap, or astragal. The easiest way to do this is by connecting, mechanically, to the cast-iron cap plates; though if copper rods are used, the connection is preferably made through the medium of porcelain insulators, to prevent galvanic action between the iron and copper. A bonding ring, imbedded in the brickwork, is a good ground connection at the top, and at the bottom there is nothing better than a plate thrown into the bed of a stream or pool of water that does not dry out. The ribbon, or connection should be connected, electrically, to the body of the stack at every point where it is fastened to it, throughout the entire height of the stock.

Colliery Notes.

It has been found that creosoting mine timbers used in upcast shafts greatly prolongs their usefulness. In Belgium creosoted Baltic pine is now employed in place of the more expensive oak that was formerly in general use in collieries.

The most reliable test for the detection of carbon monoxide gas, the product of a coal mine explosion, is to send a mouse down the shaft in a small cage. A mouse is 20 times more sensitive to the gas than a man. This old test is far superior to the lamp test.

Power may often be transmitted from the surface to the face of the workings in a coal mine by compressed air better than any other means. The chief disadvantages of the compressed-air system are, danger of dislocation of the pipe lines through fall of roof, and less flexibility when applied to underground haulage than the electric system.

In Illinois, the mine maps are required by law to show the surface boundary lines of the coal rights pertaining to each mine, and all sections or quarter section lines or corners within the same; the lines of town lots and streets, the tracks and side-tracks of all railroads, and the location of all wagon roads, rivers, streams, ponds, buildings, landmarks and the principal objects on the surface.

The best air in a colliery after an explosion is generally found at the lowest places. Carburetted hydrogen with admixed black-damp tends to rise. But in mines that do not give off much gas, the upper places sometimes contain the best air; as black-damp being heavier than air tends to go into the lowest places. When an accident occurs the first thing to be done is to find whether the best air is on the top or floor of the roadways.

Blown-out shots in coal mines can be avoided by paying attention to the drilling and charging of holes. A hole should not be drilled close to another hole, or in a crack in the stratification. The charge should be proportioned to the work expected of it. A clay-sand tamping should be used. The most fruitful causes of blown-out shots are badly placed, wide-mouthed drill-holes that have been badly charged and tamped.

The term "capacity," when applied to an air compressor, is often misunderstood. It relates to the piston displacement in the large low-pressure cylinder of the compressor; it does not refer to the amount of compressed air the machine will deliver. The same machine when working under different pressures, or at different elevations above sea level, has the same capacity; but delivers different quantities of compressed air per unit of power.

The Pennsylvania mining law requires the engineer in charge of the ventilating machinery at a colliery to examine thoroughly the machinery at the beginning of each shift, and to keep it running at such speed as the mine foreman directs in writing. He cannot stop the fan without the written permission of the foreman, except in case of serious accident. He must then immediately notify the foreman, and if necessary give warning to the men in the mine.

Electric coal conveyors are employed on some of the docks on the Tyne, England. They consist of a movable chute, 4 ft. wide by 2 ft. deep, and project 25 ft. over the edge of the pier. The coal is discharged from the railroad cars into a fixed hopper, and runs from this hopper into the back end of the chute. The floor of the chute is an electrically driven endless belt which lifts the material upward on an incline. The coal can be delivered at a height of about 45 ft.; the ordinary capacity is 500 tons per hour.

The best men in a coal mine should be be instructed in rescue work, and supplied with written instructions in regard to what is expected of them in case of an accident. They should not all go into the mine after an explosion, but should work in three or four short shifts, so that there will always be a sufficient number of fresh energetic workers always on hand. Frequently many valuable lives are sacrificed in rescue work through lack of intelligent and systematic direction. There should be frequent rescue drills at all large coal mines, similar to the usual weekly fire drills on ships.

In laying out the workings in a new colliery it is desirable to arrange for the running of additional main airways to carry large volumes of fresh air to the face of the mine, after the roadways have reached a mile or more from the main entry, when there should be sufficient capacity for supplying 100,000 cu. ft. of air per minute, or more, as most mining laws require. This is best done by keeping open a number of places which have been run parallel with the main airway, and in this manner permitting additional air channels to be easily and quickly provided to carry currents to any working district whenever they are needed.

Good coke can be made by mixing lean coal with a good coking coal, finely pulverizing the mixture, and compressing the charge in the coke oven. It is an advantage to compress the mixture into small blocks before charging the oven. The charge in the oven is compressed by cast-iron plates covered with fire-brick in order to protect the iron from burning. Pressure is exerted by hydraulic power. It is found that as the soft coal is regularly and evenly compressed during the period of caking, a better adhesion of the coal particles is produced. The hot pressure plates effect a caking of the upper layers of coal. The time of coking is the same as by ordinary processes and about 70% of good smelting-coke is obtainable.

Correpondence and Discussions.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of this JOURNAL.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

The Sluice-Head.

Sir—Captain C. C. Longridge, in his book on Hydraulic Mining, defines a sluice-head as: "A uniform and constant stream delivering o e cubic foot (of water) per second," probably founding his definition on law or custom in New Zealand.

In the Yukon Territory and Alaska the term sluice-head has been in colloquial use since 1898, and probably since the earliest days of placer mining in that country, and the following remarks may give some idea of the ordinary acceptation of the word among the miners.

The gold of these placer mines is found associated with the gravels of the rivers and brooks and the natural flow of the water in those streams is conducted in ditches and flumes to the points where it is needed; it is then used in sluicing the gravel and separating the gold from it. The water so used was seldom measured in any definite way; it was used as long as there was enough water in the stream to fill the sluice-boxes to a sufficient depth to carry the gravel through them. Or, it might be that several miners were taking water from a stream at or near the same place, in which case each man would divert from it just as much water as would furnish the necessary supply for his sluice boxes. This quantity of water, a sufficient supply for the sluice-boxes of a placer miner working in a small way, was called a sluice-head. The capacity of the sluice box was therefore the determining factor in the quantity of water thus taken and used. A "good sluice-head" would be as much water as the miner could use in his sluice-boxes; a "small sluice-head" of water would carry gravel through his boxes, but would not fill them up to their greatest working capacity. These expressions were fairly well understood by the miners, though it was often difficult to explain them to others, or to translate them into definite weights or measures.

In order to understand them clearly it is necessary to briefly describe the sluice-boxes in general use, and the grades on which they were set.

At first the sluice-box in general use was 12 ft. long, with a bottom 12 in. wide at the upper end, and 10 in. wide at the lower end, and with sides made of boards 11 in. wide at the upper end and 10 in. wide at the lower end, giving the box a depth of 10 and 9 in. at the upper and lower ends respectively. Such boxes

could be very easily arranged in a string, or moved from place to place, as the small end of one box was simply slipped into the large end of the one below it. In these boxes riffles, usually made of poles 2 to 3 in. in diameter, were laid, and the boxes would then have a depth above the riffles of from 6 to 7 in. At this time these boxes were usually set on a grade of 6 in. to the box length, or half an inch to the foot. To furnish an efficient supply of water for such a box, so placed, would need about 45 cu. ft. of water per minute, or about 30 miner's inches, a miner's inch being taken at 1½ cu. ft. per min., as defined by the Canadian mining laws.

Later, as lumber became less expensive, and as mining began to be conducted on a somewhat more extensive scale, sluice-boxes 14 in. wide at the larger end, and 12 in. wide at the smaller end, with an inside depth for the empty box of 10 in. at the smaller end, came into rather general use; at the same time longer flumes were built to conduct water from the creek to the mine, thus delivering it at a higher elevation. Consequently it became possible to set the sluice-boxes on a steeper grade, so that 9 in. to a box-length of 12 ft. became the prevailing grade. The quantity of water which could be used in these boxes in sluicing the gravel and washing the gold from it was about 100 cu. ft. per min. or 67 miner's inches, and this was still called a sluice-head, though to the old miners the mental impression was always of the smaller rather than of the larger quantity of water.

Some miners in the Klondike now use larger boxes than those above mentioned, but the meaning of the term sluice-head has never been extended to cover the quantity of water necessary to supply such boxes.

Thus we see that in the vernacular of the miners of Alaska and the Klondike the term means a quantity of water ranging from 45 to 100 cu. ft. per minute, or 30 to 67 Canadian miner's inches, with a decided leaning toward the smaller figure.

The term is certainly a convenient one, and to avoid confusion Captain Longridge's definition of 60 cu. ft. of water a minute should be generally accepted for it. It thus becomes convertible with the *second-foot* and would at once become more intelligible to many hydraulic and and placer miners.

J. B. TYRRELL.

266 McLaren St.
Ottawa, Canada.
Jan. 20, 1906.

Anthracite Miners' Certificates.

Sir—Commenting on a recent editorial on "Anthracite Miners' Certificates" (this Journal, Dec. 23, 1905, p. 1169), the so-called Shaleen case cannot be taken to the Supreme Court of the United States. Section 709 of the Revised Statue provides an appeal or writ of error only when the validity of a State statute is upheld against a Constitutional objection. When the State Court declares the statute void, there is no appeal. T. J. JOHNSON.

New York, Dec. 23, 1905.

Cyanidation in 1905.

Sir—In my article on "Cyanidation During 1905," published in the JOURNAL of Jan. 13, a serious error occurred on page 78, doubtless through a slip of the pen in editing the article. It was said "that the Homestake treats very low-grade material; but that it is commercially successful, has not, as yet, been demonstrated."

Unfortunately, before the word "Homestake," the words "in Dakota" crept in, making it read as if the mill under discussion were the Homestake in South Dakota, which it decidedly is not. The Homestake of South Dakota is eminently a commercial success, and it would be advisable to rectify the error, although, of course, the fact that it was merely a clerical error, inasmuch as everyone knows that milling at the Homestake of South Dakota is very successful, must have been obvious to those acquainted with the facts.

CHARLES H. FULTON.

Rapid City, S. D., Jan. 16, 1906.

New Publications.

Resource Map of the Dominion of Canada. Compiled by James White. Pp. 20; 3½ by 6½ in., Map 11½ by 18½ in. Ottawa, Canada, 1906: Department of the Interior.

Mineral Resources of the United States, 1904. Compiled under direction of David T. Day, Chief of Division of Mining and Mineral Resources, United States Geological Survey. Pp. 1264; 6 by 9 in. Washington, D. C., 1906: Government Printing Office.

Aladdin Folio. No. 128, U. S. Geological Survey. By N. H. Darton and C. C. O'Harra. Pp. 8; illustrated. 17 by 22 in.; paper, 25c. Washington, D. C., 1905; The U. S. Geological Survey.

This folio describes a tract in the extreme northeastern corner of Wyoming, and a narrow strip in western So. Dakota; the economic features consider the soil, and water supply (surface and underground), of the district. The folio matches the Sundance folio to the south.

Cours de Mécanique Appliquée aux Machines. Steam Generators, Vol. 4, 2nd edition. By J. Boulvin, Pp., 320; illustrated. 6½ by 10 in.; paper, $3.25. Paris, 1905: E. Bernard.

Engineering-Contracting and Roadmaster and Foreman. Vol. XXI, No. 1. Pp, 26 + 10; illustrated. 9 by 11½ in., paper, $1 per year. Single numbers 10c. New York, Jan., 1906; Myron C. Clark Publishing Company.

This is the new name of our old friend, the former *Roadmaster and Foreman;* it is the first number to appear under the editorial direction of Halbert P. Gillette. The number is a decided improvement upon the old publication, and contains much that is practical and of interest to the constructor. The most important articles give details and figures of cost; this gives the publication a value that is entirely beyond the appearance of its modest exterior.

Professional Papers.

Briquetting of Iron Ore, and the Testing of the Briquettes. H. Wedding, *Stahl und Eisen,* Jan. 1, 1906; pp. 2-8.

Gas Purification, The present condition of Meyjes-Zweibrücken. *Stahl und Eisen,* Jan. 1, 1906; pp. 27-35.

Electrochemistry and Electrometallurgy in 1905. Chas. F. Burgess. *Elec. Review* (N. Y.), Jan. 13, 1906, pp. 50-51.

Radio-Activity, The present position of. Fred'k. Soddy. *Electrician* (London), Jan. 5, 1906, pp. 476-479.

Concrete, The action of sea-water upon. J. W. Sandeman. *Engineering* (London), Jan. 5, 1906, pp. 1-2.

Steel, Ammonium persulphate in the determination of chromium in. H. E. Waters. *Proc.* Eng. Soc. W. Pa., Nov., 1905, pp. 465-468.

Mine Door, Hydraulic-pneumatic. L. L. Logan, *Mines and Minerals,* Jan., 1906, pp. 244-245; illustrated.

Vanadiferous Sandstone, Utilizing. J. Ohly, *Mines and Minerals,* Jan., 1906, pp. 249-251; illustrated.

Coal, Asphaltic. W. R. Crane, *Mines and Minerals,* Jan., 1906, pp. 252-255; illustrated.

Power Plants, Modern gas-engine. Franz Koester, *Eng. Rec.,* Jan. 6, 1906, pp. 13-15; illustrated.

Fan Blower, Conditions of design. W. B. Snow, *Cassier's Mag.,* Jan., 1906, pp. 219-229; illustrated.

Fire Hazards, How to avoid. Washington Devereux, *Cassier's Mag.,* Jan., 1906, pp. 209-218; illustrated.

The economy with which natural gas can be transferred to widely separated points by pipe lines has made it possible for one State to market large quantities of it in adjoining States, even when points of production are more than 200 miles distant from those of consumption. A considerable portion of the natural gas produced in northern Pennsylvania is sold in New York. On the other hand West Virginia furnishes large amounts of natural gas to western Pennsylvania. Ohio is supplied by West Virginia, with considerable quantities from Kentucky, Pennsylvania, and Indiana. Indiana furnishes a considerable quantity to Chicago.

"The Mineral Industry."

BY R. W. RAYMOND.

Volume XIII of THE MINERAL INDUSTRY, covering the year 1904, has recently appeared. It contains, in separate articles, industrial and commercial statistics (giving production, prices, exports and imports, etc., mainly from official sources, or the current reports of THE ENGINEERING AND MINING JOURNAL) of the minerals and metals won by mining not only in the United States, but also in the important producing districts of the world.

I regret to note in this volume, as in Vol. XII, the absence of the admirable consolidated and tabulated statistics of all countries, revised and reduced to common units of weight and value, which, in earlier volumes of the series, occupied many pages at the end. The preparation of such tables is a costly and laborious affair; the late Mr. Rothwell spent upon their early publication more money and pains than it was commercially worth; and the result was an amazing journalistic *tour de force.*

But it seems to me that the considerations which might justify the omission, from a given volume of THE MINERAL INDUSTRY, of such elaborate and recent world-estimates, do not warrant the omission, from later volumes, of similar compilations (rendered more accurate by the delay), covering preceding periods. I trust the publishers of this famous and invaluable series will supply this defect hereafter; and I can assure them that comprehensive and authoritative summaries of this kind, though they be a couple of years "behind time", will be welcomed by the public to which they appeal. Even as a purely "business" proposition, it is worth while to make such a publication more than a temporary chronicle, by including in it such features as will not only induce the immediate purchase, for immediate use, of a given volume, but also dispose the purchaser of that one to acquire the back-numbers, and the future ones. THE MINERAL INDUSTRY is not an ephemeral publication, and ought not to be so regarded.

In the particular department considered above, this volume is, to a large extent, a compilation of material selected from the columns of THE ENGINEERING AND MINING JOURNAL, and revised, arranged and edited by Mr. Edward K. Judd, of the staff of that periodical. If it were no more than that, I do not hesitate to say that the professional readers of that journal, confused (as we all are) by the abundance and variety of the information which it offers every week, are grateful to any competent person who will thus select and arrange its essential items.

But aside from commercial statistics, etc., THE MINERAL INDUSTRY continues to be, as it has always been, a comprehensive summary of technical progress, presenting, for many leading industries, up-to-date pictures of what patent-lawers call "the state of the art." The list of forty contributors to this volume comprises names of international reputation as authorities in their special departments. Such reviews of recent practice and literature as those of Prof. Robert H. Richards (on ore-dressing and coal-washing), Prof. J. F. Kemp (on ore-deposits), Prof. H. O. Hofman (on lead-smelting), and Mr. W. R. Ingalls (on the metallurgy of zinc) are invaluable to students and authors; and there are numerous other contributions, less extensive and complete, yet scarcely less worthy of praise.

The day is long past, when any publication could be expected to contain all existing knowledge, even in a limited field. What we now demand is an intelligent guide to our special investigations; and I can bear witness that, for its wide field, THE MINERAL INDUSTRY has been to me such a guide. In default of personal knowledge, I always consult it first, before entering upon laborious and indefinite investigation among books or periodicals; and I expect to get from it, if not all that I wish to know, yet much help in my further search. For this purpose the usefulness of the book is established by the complete alphabetic index to its contents —in the absence of which I would never have consented to give it any notice at all. Compilations and treatises without adequate indexes (except my own scrapbook, the index to which I carry in my head) I heartily hate, as does everybody else who is obliged to rummage through them.

Natural Gas.*

BY F. H. OLIPHANT.

The source of natural gas is usually an open, porous, or pebbly sandstone, or a limestone whose structure presents cavities caused by rearrangement of crystals, or whose sandy beds have prevented the complete solidification of the limy structure. A limited quantity of natural gas is also found in the great Devonian shale deposits.

The structural requirements for the separation of natural gas from petroleum and salt water are the gentle arching or curving of the rocky reservoir, and an impervious cap of soft yielding shale or slate, which closes up any fractures in the rock and seals in the reservoir until it is tapped by the drill.

These reservoirs are usually found covering large areas and produce immense quantities of gas, but in some cases they are limited in area and are then speedily exhausted.

The rock pressure and the output of gas wells are usually measured when the well is new and they are at their maximum. Even the longest life of a gas well is short, and the rock pressure decreases with every foot of natural gas taken out. It is not usual for wells having the greatest rock pressure to produce the greatest volume of natural gas, as an open pebble sand gives up its stored products more rapidly than a sand of closer texture; therefore the more open the texture of the strata, the shorter but more vigorous will probably be the life of the pool. Many pools that were most vigorous are almost entirely destitute of natural gas today. The gas in some of them has been so far removed by gas pumps that when they are opened the air flows into the vacuum in the porous strata once packed with high-pressure gas. In many virgin fields, especially in the beds of streams, innumerable small vents and bleeders are often found, from which there is an escape of more or less natural gas in the form of bubbles. Against the hydrostatic pressure the bubbles find vent, and escape into the air. As the pressure decreases, the water usually climbs up toward the more elevated portion of the reservoir. These innumerable vents, during the ages that have passed, have acted as safety valves, and have allowed the escape of many millions of cubic feet of gas into the atmosphere. The contents of the known reservoirs are probably but a small fraction of the gas that has been dissipated in the air.

The search for and the production of petroleum, moreover, have caused a great loss of natural gas, since frequently the gas is found in the higher portion of the sand containing the petroleum, and is tapped before the petroleum is reached. In many cases the natural gas has been allowed to flow into the atmosphere and be wasted until the pressure was sufficiently exhausted to permit drilling to proceed.

*From Mineral Resources of the United States for 1904.

Russian Coal Production.

According to a Russian paper the coal production of European Russia in 1904 was as follows, as expressed in tons: South Russia, 13,924,000; Poland, 5,068,000; Ural region, 577,400; Moscow and vicinity, 240,900; Caucasus, 46,800; total, 19,857,100. The production of coal in Asiatic Russia in 1903, the last year for which figures are available, was as follows, in tons: Turkestan, 20,000; West Siberia, 267,220; East Siberia, 506,500; total, 793,720 tons.

According to Dr. George F. Kunz, the great diamond "Excelsior," found in the Jagersfontein mine, in South Africa, has been cut into separate stones. This large stone, which was found in 1898 in the Orange Free State, weighed in the rough 971¾ carats, or about 7¼ oz., and was valued on the spot at $1,000,000. It has been divided into 10 stones weighing from 13⅞ to 68 carats each, furnishing a total of 340 7-32 carats, worth a total value of $400,000.

Transvaal Capitalization.

Even so steady an advocate of Rand values as the London *Economist* criticizes the appeals of Rand mine owners sharply, as in the following extract from its issue of Jan. 6: "The financiers responsible for Transvaal mining are continually insisting that cheap labor and cheap everything must be provided for them in order that the industry may be carried on at a profit. The fact is that the mines would yield a fair return, without artificial aid or bolstering up of the gold industry, on a moderate valuation, and it is the inflated capitalization of the industry that is at the root of the trouble. . . .This is how inflation begins, and if the public help it on by being foolish enough to participate in engineered booms, they need not be surprised if they have to take the consequences.

"When investors here have lost their money in over-capitalized industrial concerns at home, they have had to pocket their losses and to reduce the capitalization to a moderate basis. The last thing in the world they think of doing is to ask the Government to assist them to make good their deficits, and if they were to take that course they would only bring ridicule on themselves. And why should those interested in the mining industry expect different treatment? The fact is, the inflated capitalization of the gold mining industry constitutes the kernel of the whole problem of the Rand, and it is sincerely to be trusted that this matter will be kept well to the fore when the question comes up for consideration in the Transvaal Legislature."

The Prescott & Eastern Railway Extension.

BY W. A. DRAKE.*

The mines of the higher Bradshaw Mountains seemed to justify the construction of a railroad at least as far as what is called the Bradshaw Basin, in which is located the well-known Crown King mine. Those familiar with the undeveloped mines of that district knew that only the transportation facilities of a railroad would make their development and operation practicable, and it was therefore decided to extend the Prescott & Eastern Railroad to Crown King.

The district lies S. 23° W. of Mayer and 15 miles away in a direct line. It is about S. 30° E. of Prescott and 24 miles distant in a direct line. By rail it is 60 miles from the latter and nearly 29 miles from the former. Before the railroad began the ascent from Mayer, it was necessary to cross the deep narrow gorge of Turkey creek or make a long detour which would have forced the road into a country scored with many deep V-cañons, making an impracticable construction.

Crown King is at an altitude of 5,806 ft., and Turkey creek was crossed at 3,370 ft. The direct line distance is 9 miles, and traverses a very rough section of the mountains. It was found possible to overcome this rise by using 4% grades and sharp curves, but such a line crossed many deep cañons and required several tunnels; in fact, developed an estimated cost that made its construction impracticable, especially in view of the fact that the expected traffic remained to be developed.

The problem, therefore, was to find a line which could be constructed at the least consistent cost; sections of the smoothest mountain slopes must be determined and the road built thereon. It was finally determined to locate a part of the line on switchbacks, and the road was so laid out and constructed. A maximum grade of 3½% equated, with 16° curves, was adopted, and by a careful selection of back-up lines a cheaply constructed road was located. There are five back-ups, or 10 switches to throw. These range from 1,500 ft. to 4,000 ft. in length and are located on the smoothest ground, with slightly easier grades and curves, with the object of giving the back-up train a little advantage. Snow and all other conditions received proper consideration before the adoption of the plan.

The tails of back-ups are continued on a rising grade from switch stands, there being rarely more than one train in either direction on the district at one time. The train crew has become so handy with the work that a brakeman drops off the last car as it passes the switch, and the engine is backed before a passenger hardly realizes that the train has been stopped. The loss of time is very slight, the loss of roadway of the tails is not great and the dangers from backing are more imaginary than real, the backing or forward speed is necessarily slow.

Considerable expenditure was saved in the cost of construction at but little expense of operation by the adoption of this plan, and it is thought for all reasons given to be eminently well chosen. The projector and promoter of this railroad was F. M. Murphy, of Prescott, Arizona. The Atchison, Topeka & Santa Fé Railway Company is now the owner.

*General Superintendent and Chief Engineer, Santa Fe, Prescott & Phoenix Railway Co., Prescott, Ariz.

Calcium Nitrate Manufacture in Norway.

Consul Henry Bordewich reports from Christiania as follows: "During the last two years Prof. Kr. Birkeland, of the University of Christiania, and Mr. S. Eyde have been engaged in perfecting a method for oxidizing the nitrogen of the atmosphere. An experimental factory has been in operation at Notodden, Telemarken, since the beginning of 1905. Large works are now to be erected at Svälgfos, near Skien, where 30,000 h. p. will be available.

Petroleum in Northern Peru.

BY V. F. MARSTERS.*

Of late years there has been an increasing interest in the development of the oilfields of Northern Peru. For many years it has been known that lubricating and fuel oils existed at several points in the Provinces of Paita and Tumbes. Some of these have been developed in a commercial way within the last 10 or 15 years. The oldest fields now placing oil on the Peruvian markets are those situated at Nigritos and Zorritos. At Lobitos, however, about 20 miles north of Nigritos, and on the coast, is a new field recently developed by the Peruvian Corporation. In this locality exploratory work has been carried on for nearly three years, on a somewhat modest scale. The first work in the field was attended with various difficulties, which seriously hampered and interfered with rapid exploration. At the present date 17 wells have been put down, and eight of them are now producing oil. The most productive ones have been bored during the last 10 months. The oil bearing sand is tapped at a depth of about 1,000 ft. Above the sands the entire series of deposits is made up of very fine clays. In such of the wells as have penetrated the oil sand, the fine clay again appears. Only a few feet has been penetrated below the oil horizon. From the structure of other fields it would seem quite probable that other oil sands may be found at a greater depth. No effort has been made, however, to demonstrate this suggestion. There are 1,000 tons of tankage, all of which is filled with oil. The product already on hand is soon to be placed upon the Peruvian markets. Sufficient work has been done and results obtained to place this field on the list of producers in Peru.

The Mineral Industry of Siberia.

The Department of Mines under the Russian Ministry of Finance has published a work by M. Reontovski on the subject of Siberian mineral deposits, in which the geology of Siberia and the ores of its numerous metals are treated in detail. At the end of the work the subject is summarized as follows:

Gold.—This has always afforded the principal mineral wealth of Siberia, its value exceeding four times that of all other metals. It must not be supposed that the gold deposits are exhausted; the supply of this metal remaining in Siberia is beyond calculation.

Iron.—The total production of pig iron in Siberia from the beginning of the industry does not exceed 17,000 tons. There are, nevertheless, deposits of brown hematite and carbonate ores in many parts of Siberia. Besides these, magnetite is found

*Chief of the Geological Commission in Peru Lima, Peru.

in quantities comparable to those of the United States; its principal occurrences are in Altai, Minusinsk, Abakansk, Irkutsk, and the Trans-Baikal.

Silver.—Most of these mines, in spite of their former great prosperity, are now actually working at a loss. This is due not only to the lower value of silver, but also to the absence of coal deposits in the neighborhood of the mines, lead being the usual accompanying mineral. The rich ores of Altai have not been developed on account of their complex character (zinc and lead).

Copper.—On account of the present high price of copper, these ores are attracting more and more attention. The most important copper ores are found in the districts of Tomsk and Yeniseisk, and particularly in Altai. A considerable development, although sporadic, of these ores is found in the Kirghiz steppes.

Manganese.—Deposits of pyrolusite are found in the districts of Tomsk and Yeniseisk, but those in the Kirghiz steppes are undoubtedly the most attractive.

Tin.—Deposits of cassiterite are found in the valley of the Onon river in Trans-Baikal. Their development will require excessive mechanical preparations.

Antimony.—The future of this mineral is probably assured by the presence of deposits in Amur, and in other places.

Sulphur.—This is found in Trans-Baikal, and particularly in the Kamchatka peninsula. This last deposit could be developed with considerable advantage.

Coal.—Immense basins of Carboniferous coal are known at Kuznesk, in Altai, at Pavlodar in the Kirghiz steppes, and at Soutchan, in the Maritime region. The north end of Saghalien island contains a great deposit of Tertiary coal. Besides these, numerous deposits of Quaternary coal and lignite are found, which will be of particular advantage to the Trans-Siberian railroad.

Graphite.—Deposits of graphite are numerous. The best known are the Alibert in Irkutsk, and Turukhansk in Yeniseisk. These graphites are not excelled by those of any other part of the world, but they are not now being worked.

Petroleum.—Petroleum fields are known in the north of Saghalien island; those near Lake Baikal are less known, but they probably deserve attention.

Salt.—Rock salt is found in only two places; in the region of Semirechie, and in the district of Irkutsk. Salt lakes and springs arising in Tertiary and later deposits are worked in many places. It is noticeable that the great regions of Amur and along the sea coast contain no salt springs of any nature.

Puzzolan cement, properly made, contains no free or anhydrous lime, and does not warp or swell. It is liable to fail from surface cracking and shrinking, however, in dry air.

Questions and Answers.

Legal Entry of Coal Lands.

Can I, a legal citizen of the United States, enter, under the Revised Statutes, Sections 2347 to 2352 inclusive and the regulations thereunder issued July 31, 1882, coal land in Alaska *agreeing and contracting to sell the 160 acres I thus enter for a consideration* to a party or association, which has already entered its limit of 640 acres under improvement clause; which party or association will undertake to pay the Land Office the $10 per acre (or $20 as the case may be) to perfect the title I contract to sell to it? This is being done by wholesale here in the coalfields the Alaska Central Railway will penetrate. It seems to me to defeat the spirit of the law.

M. S. D.

Answer.—The right to purchase Government coal lands can only be exercised once. A coal entry may be made by one qualified person on behalf of another qualified person, who has not exhausted his right. But the entry by a qualified person on behalf of one disqualified, or in the interests of a corporation or association of persons, one (or more) of the members of which is disqualified, or may have already availed himself of the privilege, is against public policy, and a fraud upon the Government. Claims so procured may be annulled by the courts.

Inchoate rights arising from an accepted application for coal lands, or a declaratory statement filed in the proper land office may be assigned to anyone possessing the necessary legal qualifications. In the event of an assignee perfecting his title, the rights of assignor and assignee to make entries are extinguished. Coal-mining claims may be legitimately amalgamated in any number only after titles have been perfected.

Abstracts of Official Reports.

Wolverine Copper Mining Company.

The annual report of this mine, on the Kearsarge lode, in Keweenaw Co., Michigan, covers the year ending June 30, 1905.

Although a strike among the trammers in April caused a cessation of work for half a month, the production of mineral was 11,982,345 lb. yielding 81.20% or 9,729,971 lb. refined copper, which was disposed of at 13.83c. per lb. This amounted to $1,351,880, including $6,478 interest received.

The cost of production was $746,444 and this, divided into two general classes, showed:

Working expenses at mine	$496,061
Smelting, freight, marketing and all ex..	109,373
Total	$605,434

The cost of production of refined copper was therefore at the remarkably low rate of 6.222c. per lb. The year's work may be summarized thus:

Rock hoisted	336,780 tons
Rock stamped	321 813 "
Product of mineral	11,982,345 lb.
Product of refined copper	9,729,971 "
Yield of rock treated 30.23 lb. per ton or	1.51%
Cost per ton of rock hoisted	$1.47
Cost per ton of rock stamped	1.51
Cost per lb. of refined copper at mine	5 098 c.
Cost of smelting, freight and marketing product, including New York office expenses..	1.124 c.
Total cost per lb. of refined copper.	6.222 c.
Total cost per lb. of refined copper, including construction	6.274 c.

Shaft sinking, drifting and stoping have been steadily carried on and the rock, from the lode which is being worked, shows very little barren ground.

Openings for the year were.

Sinking shafts	512 ft.
Drifting and cross cutting	4,478 ft.
Total stoping	20,198 fathoms

Of the 336,780 tons of rock hoisted 4.44% or 14.967 tons were discarded as poor.

No. 3 shaft is down to a point below the 28th level and No. 4 has been sunk to below the 24th.

In seven years the company has paid in dividends $2,070,000 including that of April 5, 1905, and there remains a surplus of $821,364 in the treasury.

De Beers Consolidated Mines, Ltd.

The report covers the year ending June 30, 1905. Operations are distributed over four mines, the relative productivity of which may be shown thus:

Mine.	Yield per Load, Carat.	Value per Carat.	Value per Load.
De Beers and Kimberley	0.46	$12.68	$5.81
Wesselton	0.284	8.86	2.52
Bultfontein	0.41	8.38	3.42
Dutoitspan	0.26	16.78	4.37

The total production of "blue ground" from De Beers and Kimberley mines was 2,447,850 loads, as against 2,440,895 for the preceding year. The amount washed and crushed was 2,418,158 loads, as against 2,401,099 loads in the preceding year. The average cost of winning and washing was $1.84 per load. Wesselton mine produced 2,068,278 loads; Bultfontein 605,730 loads; and Dutoitspan 311,499 loads. The number of loads of "blue ground" on all the floors on June 30, 1904, was 3,944,397. The company produced 5,433,357 loads, and washed 5,128,015 loads during the year; leaving 4,249,739 loads of unwashed material on hand, or an increase of 305,342 loads during the year.

The De Beers mine has two shafts, respectively, 2,076 and 1,670 ft. deep. Rock proved above the 1,670-ft. level amounts to 2,560,900 loads; between this and the 2,076-ft. level, reserves are estimated at 3,376,300 loads. The mine has to pump 3,874 gal. of water per hour.

Kimberley mine has 892,300 loads above the 2,200-ft. level; reserves are estimated at 1,196,900 loads between this and

the 2,520-ft. level. The mine makes 8,516 gal. of water per hour.

Wesselton mine is 500 ft. deep, and has 12,915,800 loads above this level. It makes 33,838 gal. of water per hour. Inclined haulage has been abandoned; all ground is now dropped into the 500-ft. level and hoisted through the shaft.

Bultfontein mine in 600 ft. deep, and has a reserve of 13,866,000 loads above this level. It makes 6,486 gal. of water per hour. Hoisting from the open mine has been stopped.

Dutoitspan mine is 750 ft. deep; its reserve above this level is estimated at 24,518,500 loads. This mine makes 14,106 gal. of water per hour.

The cost per load of mining and washing is given herewith. In each case, the total cost for laying the "blue ground" at the dressing floor includes the cost of handling waste rock. A "load" occupies 16 cu. ft., and weighs 1,600 pounds.

Mine.	Mining.	Washing.	Total.
De Beers.....	$1.17	$0.62	$1.79
Kimberley.....	1.29	0.71	2.00
Wesselton.....	0.61	0.31	0.92
Bultfontein.....	0.98	0.44	1.42
Dutoitspan.....	1.91	1.04	2.95
Average.....	$1.19	$0.62	$1.81

The company's recently erected dynamite factory at Somerset West has made rapid progress, and turned out 175,281 cases during the year. The original capital expenditure on this plant was £750,000; but other expenses and depreciation have brought the total up to £1,308,264.

The railroad, which the company started a year ago to build from its colleries at Vierfontein to the diamond fields, has made good progress. The entire roadbed is graded, and 92 miles of track had been laid by the middle of September, 1905, leaving 52 miles to be finished. Coal trains were expected to be running by the end of 1905.

Without itemizing the expenses at the individual mines, the profit-and-loss account may be stated thus:

Sale of diamonds.....	£ 4,802,845
Increase in stock of "blue ground".....	29,967
Dividends, interests and other receipts	92,598
Total receipts.....	£ 4,925,410
Mining and surface expenses.....	£ 1,288,001
Milling.....	618,066
Office and management.....	131,082
Interest, redemption and depreciation.	939,162
Total expenses.....	£ 2,976,311
Profit for the year.....	£ 1,949,099
Balance brought forward.....	697,685
Balance available for dividends.....	£ 2,646,784

From this, common and preferred stockholders received £1,800,000 during the year, at the rate of 40% each. The company's capital indebtedness includes 800,000 preferred and 1,000,000 common shares, of £2 10s. each. Of its mortgage obligations, £4,053,545 is still outstanding.

As true Portland cement having slag for its hydraulic base is now made, the term "slag cement" becomes obsolete and puzzolan should be used for all mixtures not subsequently calcined.

Sand-Lime Bricks.

Consul-General Guenther, of Berlin, reports that bricks of sand and lime, which were first made in 1880, but have only been used on a large scale for the last eight years, are becoming in Germany a dangerous rival to the old style of clay bricks. The assertion that the quality is superior to clay bricks remains to be proved. The industry is too young for a final opinion as to how long or well these new bricks will last. The edges, if the proper pressure is employed in their manufacture, are sharp and even; they do not warp, and the walls erected from them present an even and uniform appearance.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ended Jan. 6, 1906.

809,934. WORKING ROLLED METALS.—John V. Culliney, Lebanon, Pa. Filed Jan. 23, 1905.

809,939. APPARATUS FOR RECOVERING PRECIOUS METALS.—Edward J. Garvin, Portland, Oreg. assignor to Garvin Cyanide Extraction Company, a Corporation of Oregon. Filed June 16, 1905.

809,953. ROASTING-FURNACE.—Ottokar Hofmann, Argentine, Kans., assignor to The United Zinc and Chemical Company, Kansas City, Mo., a Corporation of New Jersey. Filed Feb. 19, 1904.

809,959. PROCESS OF SEPARATING MINERALS.—Edmund B. Kirby, Rossland, Canada. Filed Dec. 14, 1903.

809,997. METAL-TURNING APPARATUS. Richard H. Stevens, Munhall, Pa. Filed June 19, 1905.

809,998. MANUFACTURE OF ARTIFICIAL FUEL.—August Stillesen New York, N. Y. Filed Feb. 21, 1905.

810,006. AUTOMATIC SAFETY ATTACHMENT FOR STAMP-MILLS.—James C. H. Vaught, Lead, S. D. Filed Mar. 29, 1904.

810,022. METHOD OF PRODUCING VITRIFIED BRICK, TILE, AND VARIOUS SHAPES.—Ralph Baggaley, Pittsburg, Pa. Filed Dec. 23, 1903.

810,059. PROCESS OF PREVENTING THE FORMATION OF SCAFFOLDS IN KILNS. Tom C. King, New York, N. Y., assignor to National Metallurgic Company, Jersey City, N. J., a Corporation of New Jersey. Filed Sept. 5, 1905.

810,063. DUPLEX SMELTING-FURNACE.—Robert Lindemann, Osnabrück, Germany. Filed Mar. 10, 1905.

810,073. PORTABLE MELTING AND HEATING APPARATUS.—Henry B. Nichols, Philadelphia, Pa. Filed July 19, 1904.

810,097. WELL-BORING APPARATUS.—Andrew K. Wallen, Sr., Jackson, Miss. Filed May 5, 1903.

810,167. MACHINE FOR AUTOMATICALLY SEGREGATING, MEASURING, AND DELIVERING MOLTEN GLASS.—Walter D. Morrison, San Francisco Cal. Filed Feb. 16, 1904.

810,189. SAFETY DEVICE FOR HOISTING MECHANISMS.—William Cooper, Denver, Colo. Filed May 5, 1904.

810,196. ORE-WASHING PLANT.—Frederick Eggers, Cincinnati, Ohio. Filed April 6, 1905.

810,228. FURNACE-ROOF.—Edwin E. Slick, Pittsburg, Pa. Filed July 1, 1904.

810,249. METHOD OF REFINING COPPER.—Ralph Baggaley, Pittsburg, Pa., Charles M. Allen, Lolo, Mont., and Edward W. Lindquist, Chicago, Ill.; said Allen and Lindquist assignors to said Baggaley. Filed June 5, 1905.

810,251. MACHINE FOR WASHING SAND. Richard O. Bidwell, South Vineland, N. J. Filed July 12, 1905.

810,286. FURNACE-CHARGING APPARATUS.—William G. Kranz, Sharon, Pa., assignor to The National Malleable Castings Company, Cleveland, Ohio, a Corporation of Ohio. Filed June 30, 1905.

810,298. AIR-LOCK FOR CAISSONS.—William McIlvrid, Jersey City, N. J., assignor to The Cockburn Barrow and Machine Company, Jersey City, N. J., a Corporation of New Jersey. Filed June 22, 1905.

810,301. APPARATUS FOR STORING AND CONVEYING LIQUID METALS.—Casimir von Philp, Bethlehem, Pa., assignors to Bethlehem Steel Company, South Bethlehem, Pa., a Corporation of Pennsylvania. Filed May 20, 1904.

810,315. HYDRAULIC SWIVEL.—James A. Wiggs, Jr., Beaumont, Tex. Filed Apr. 3, 1905.

810,364. METHOD OF SAVING METAL VALUES FROM SLAG.—Charles M. Allen, Lolo, Mont. Filed Sept 1, 1904.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week Ended Dec. 30, 1905.

26,874 of 1904. TIPPLE FOR WHARVES.—T. G. Wrightson and J. M. Ringquist, Stockton on Tees. Improved frame work for raising and tilting mineral wagons and discharging their contents into steamers.

29,156 of 1904. BATEA.—J. Johansen, Paramaribo, South America. Providing bateas with conical amalgamating plates at the bottom.

29,282 of 1904. CONCENTRATING MACHINE.—F. E. Elmore, London. Apparatus in which to conduct the inventors process for conducting flotation-concentration under a vacuum.

3,420 of 1905. AIR COOLING.—E. Hesketh, London, and F. A. Willcox, Sunderland. Improved method of cooling the air used in blast furnaces, etc. with the object of removing moisture.

7,398 of 1905. SCREENS.—E. D. Chester, London. In roller or pan mills for wet grinding, an arrangement of screens and deflectors so that the finer particles shall not be ground over and over again but discharged immediately they have arrived at the requisite fineness.

12,534 of 1905. ROCK DRILL.—C. Weidmann and P. Hofmann Aachen, Germany. In percussive rock drills, improved valve for controlling the length of the stroke.

12,652 of 1905. STEEL PROCESS.—H. H. Campbell, Steelton, Pa. Removing excess of of chromium from steel intended for structural purposes by continuing the bessemerising after the carbon and silicon have been removed, and removing the slag containing the oxidised chromium before starting recarburizing.

16,490A of 1905. ANTIMONIAL PIGMENT.—L. Brunet, Bronde, Paris. Making a white antimony pigment by first making sulphites of barium and lime and then mixing them with oxides of antimony.

Week Ended Jan. 16 1906.

26,280 of 1904. DEEP BORING MACHINE.—M. Schierhorn, Freiburg, Baden, Germany. An improved deep-boring apparatus, in which the drill is operated by the water used for clearing the hole.

26,727 of 1904. MINE-CAR LUBRICATION. J. Berry, Wigan. Improved automatic method of lubricating the axles of mine cars.

1,947 of 1905. PEAT-BRIQUET MACHINE.—O. Strenge, Augustfelen, Germany. Machinery for handling peat and drying it before being made into briquettes.

16,087 of 1905. CRUCIBLE FURNACE.—E. Hausmann, Cologne, Germany. A crucible furnace in which the air supply is preliminarily heated in passages formed within walls of the furnace.

20,769 of 1905. ELECTRIC WELDING.—V. Milkevitch, St. Petersburg. For the purpose of utilizing alternating currents for electric welding; having an auxiliary means of heating the electrodes and so keeping the arc steady.

21,916 of 1905. MINE CAR BEARINGS.—G. W. Tidrick, Dillonvale, Ohio. Improved dust-proof bearings for mine cars.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. J. J. Rutledge, mining engineer, of Baltimore, has been visiting New York.

Mr. Waldemar Lindgren returned from Europe Jan. 17, and proceeded to Washington.

M. P. Dalton, of Denver, Colo., was in New York recently, on professional business.

Mr. A. C. Dart has been appointed engineer for the Newhouse Mining & Smelting Co. at Newhouse, Utah.

Mr. Harold E. E. Spence has returned to Steeple Rock, N. M., from an extended personal trip in old Mexico.

Mr. Howard Evans, manager of the Stag mine at Freeland, Colo. has been making a business trip to the East.

Dr. Carl Dellwik, the well-known inventor of the water gas process bearing his name, is now in this country.

Mr. F. I. Cairns, of Houghton, Mich., superintendent of the Michigan Smelting Co., has returned from a trip to Alabama.

Dr. Bernard C. Hesse has established an office at No. 90 William street, New York, as chemical expert and consulting chemist.

Dr. N. L. Britton, director of the New York Botanical Garden, has been elected president of the New York Academy of Sciences.

Dr. F. W. Wright of New Glasgow, N. S., vice-president of the International Automatic Machine Co., is in Winnipeg, Manitoba.

Mr. W. R. Brock, Toronto, has come into possession of the St. Paul mine, Rossland, B. C., by the foreclosure of a mortgage.

Mr. Carroll Watson, of Boston, copper expert with Dane, Smith & Co., is in the Michigan peninsula inspecting copper properties.

Mr. E. J. Wilcox, of the Waldorf Mining Co., operating in Clear Creek county, Colo., has returned from a business visit to the East.

Mr. J. Q. Bennett of Burnham & Bennett, Boston, was in the Lake Superior copper district last week, inspecting some of the mines.

Mr. Frederick S. Harris, of Chicago, has been engaged as consulting engineer by the Goldfield-Crayton Mining Co., at Goldfield, Nevada.

Mr. Peter Donelson, of the old firm of iron and steel merchants, James Watson & Co., of Glasgow, is now in this country studying the situation.

Professor J. P. Iddings, of the University of Chicago, was elected president of the Geological Society of America at the recent Ottawa meeting.

Hon. G. D. Meiklejohn, of Nebraska, who is largely interested in the Decillion gold mining claims at Gold Center, Nevada, is visiting Tonopah.

Mr M. H. French, manager of the Black Hills & Denver Mining Co., operating in Gilpin county, Colo., is making a business trip to Eastern points.

Mr. Quincy A. Shaw, a director of the Calumet & Hecla Mining Co., has returned to his home in the East after a visit to the mine at Calumet, Mich.

Mr. W. F. Edwards, superintendent of the Greenough Brothers Reduction Co., at Mullan, Idaho, has been in New York on professional business.

Mr. G. M. Ashmore, of the Decatur Mining & Milling Co., operating in Moon gulch near Rollinsville, Colo., is making a visit to Decatur, Illinois.

Professor Dawbarn, who for the past twenty years has been prominently associated with the Ballarat School of Mines, Victoria, has retired from the superintendency.

Mr. T. J. Greenway has removed from Chillagoe, Queensland, to Adelaide, South Australia, where he has opened an office as consulting metallurgist and mining engineer.

Mr. Arthur C. Carson, superintendent of the property of the North Butte Co. in Butte, Mont., has returned to Butte after an absence of four weeks in southern California.

Mr. H. F. Fay, of Boston, president of the Centennial and Allouez mining companies, has been inspecting the mines with which he is associated in the Lake Superior copper district.

Mr. Thomas Bastian, who is connected with the Calumet & Hecla Co., has been inspecting copper mines in Butte recently. He will visit Utah and Arizona and inspect mines in both.

Mr. Charles Colcock Jones, recently mining engineer to the Mountain Copper Co., has opened an office as consulting mining engineer in the Pacific building, Los Angeles, California.

Mr. W. H. Shockley, who has been recently engaged in professional work in Siberia, passed through New York Jan. 18, on his way to Nevada, where he expects to remain several months.

Mr. Leigh G. Hancock, who has managed the Parramatta and Yelta Copper mines, Moonta, South Australia, for many years, has resigned. He will be succeeded by the Count de Vernancourt.

Mr. Albert J. Bone recently resigned as head assayer and chemist at the National Metal Co.'s refinery in Mexico City to accept a similar position with the Compañia Metalurgica de Michoacan, in Ocampo, Michoacan.

Mr. P. O. Wells recently resigned the position of assistant superintendent of the Lake Superior Smelting Co.'s works at Dollar Bay, Mich., to take a position as superintendent of the International Ore Treating Company.

Mr. Leslie Bradford, who is joint patentee with Mr. A. D. Carmichael in the desulphurizing process bearing their names, has resigned his position as chief assayer to the Broken Hill Proprietary Co., in New South Wales.

Dr. F. H. Hatch, consulting engineer to Messrs. Lewis & Marks, is leaving the Rand early in March and is going to London. He is to be succeeded by Mr. C. B. Kingston, who has been in charge of Messrs. Lewis & Marks' mining interests in Italy.

Messrs. Godfrey D. Doveton, and Chester Wells Purington, constituting the firm of Doveton & Purington, announce that they have moved their offices from the Majestic Building to the McPhee Building, Denver, Colorado. They will continue their engineering practice as formerly.

Mr. L. S. Storrs, formerly assistant geologist of the Colorado Fuel & Iron Co. and for the past eight years geologist of the Northern Pacific Railway system, has been appointed expert and engineer of tests of material and supplies for the New York, New Haven & Hartford Railroad Company.

Mr. W. L. Cumings, for some time past mining engineer and geologist for Witherbee, Sherman & Co., at Mineville, N. Y., has accepted the position of geologist of the Bethlehem Steel Co. He will take up the work Feb. 1, and will be assisted by Mr. O. Martin Johnson. Both will shortly leave for Cuba.

Mr. W. S. Ayres, consulting mining and mechanical engineer, will return early in January to Hazleton, Pa., from Banff, Alberta, Canada, where he has been acting as consulting engineer for the Canadian Pacific Railway in opening up anthracite coal mines. The immediate object of his coming east is to instal his new separating machine for coal and ore in some of the anthracite coal breakers of Pennsylvania.

Mr. William H. Howard, who has filled the position of superintendent of the Pueblo plant of the American Smelting & Refining Co., will superintend the construction of a large copper plant on the Pacific Coast for the same company and manage the same when completed. Mr. T. E. Palmer, assistant superintendent of the Arkansas Valley plant at Leadville, Colo., will take Mr. Howard's place at Pueblo.

Mr. Louis W. Powell, of Duluth, Minn., has been appointed third vice-president of all the affiliated copper properties at Bis-

bee going under the general name of the "Cole Properties" and will have the full authority of the president. These include the Calumet & Arizona, the Lake Superior & Pittsburg and the Pittsburg & Duluth, all of which are now producing mines, and the Calumet & Pittsburg and Junction, both of which are still in the development stage. Mr. Powell is a mining man of long practice, and for the past six years has been assistant general manager of the Oliver Iron Mining Co., of Duluth.

Obituary.

Joseph R. Fôcht, constructing engineer of the Utah Copper Co., in Utah, died of lung trouble at Salt Lake, last week.

Mr. C. E. Nicolls, for several years in the employ of the Venture Corporation of London, died of pneumonia at Victor, Colorado, on January 6.

A. C. Moorehead, superintendent of the Nevada Chief mine, at Rockline, Lyon County, Nev., died at Wabusca, Nev., of heart failure on Jan 1. The deceased miner was well known in Virginia City where he worked for many years.

Societies and Technical Schools.

Mining and Geological Institute of India.—His Excellency the Viceroy has consented to be Patron of this newly established institute. Sir Andrew Fraser (Lieutenant-Governor of Bengal), and the Hon. Mr. J. P. Hewett (Member for Commerce and Industry in the Governor-General's Council) have accepted honorary memberships. A meeting for the formal inauguration of the institute and for hearing the President's address was to be held at Asansol Jan. 16.

Worcester Polytechnic Institute.—The thirty-sixth annual catalogue of the Worcester Polytechnic Institute, Worcester, Mass., for the year 1905-1906, was issued Jan. 1. It is a book of 210 pages, containing the usual information in regard to the courses of study offered by the Institute, the teaching force, the equipment for carrying on the work, the number of students in attendance, and the present occupations of the alumni. The total registration for the current year is 398 against 324 the year before and 272 two years ago. Of these 388, eleven are graduate students, 50 seniors, 73 juniors, 102 sophomores, and 152 freshmen. There are now 42 instructors in the institute.

Society of Geohydrologists—As an outcome of the formation of the division for the investigation of artesian waters by the United States Geological Survey three years ago, a considerable number of geologists are now devoting their entire time to the investigation of underground waters and related geology. The need of a society for the discussion of the many problems constantly arising in connection with new lines of research or investigations of more extended scope than those previously undertaken, has been felt for some time. Preliminary meetings looking to the organization of such a society were held on Dec. 9 and 11, and on Dec. 20 a formal meeting was held, at which the society was formally organized, a constitution adopted, and officers chosen. The association is composed of active members, of residents of the District of Columbia or vicinity, who are principally engaged in geohydrologic work, and associate members consisting of non-residents who have contributed prominently to the science, making it a strictly professional society.

California Miners' Association—President Alfonzo Tregidjo has appointed the following standing committees for the ensuing year:

Executive Committee—Edward H. Benjamin, Lewis T. Wright, Fred W. Bradley, S. B. Christy, W. F. Englebright, H. H. Yard, G. McM. Ross.

Committee on Finance—Eugene de Sabla, John Martin, Andrew Carrigan, Thomas A. Rickard, Joseph Sloss, James V. Coleman, George Starr, A. D. Foote.

Committee on Legislation—John F. Davis, A. Caminetti, C. W. Cross, T. A. Rickard, Charles G. Yale, Tirey L. Ford, John R. Tyrrell.

Committee on Mineral Lands and Conservation of Water—A. H. Ricketts, Niles Searles, J. M. Gillette, W. H. Clary, H. Z. Osborne, Frank R. Wehe, S. B. Christy, Charles E. Uren.

Committee on Department of Mineral Industries—W. C. Ralston, J. B. Irish, C. M. Belshaw, W. F. Prisk, F. A. Leach, F. Solinsky, Ross E. Browne.

Committee on Debris Dams—Fred Searls, Fred Harvey, W. P. Hammon, L. L. Myers, J. O'Brien, W. O. Halstead, A. B. Foote, J. S. McBride, W. W. Waggoner.

Committee on Election—W. H. Storms, Nat P. Brown, E. A. Rix, E. J. Ensign, H. E. Miller.

An advisory committee, consisting of all past presidents of the association and two members selected at large from each county in the State in which mining is prosecuted, will be named in the near future.

Trade Catalogues.

Bowen Oiling Devices are described in the new catalogue of the Bowen Manufacturing Co., Auburn, New York.

William Ainsworth & Sons, Denver, Colo., issue catalogue C, describing the Shattuck solar attachment for mining transits.

The Sullivan Machinery Co., 42 Broadway, New York, issues bulletin No. 48 B, describing the undercutting coal-mining machine as made by it.

The Bullard automatic wrench is described in the catalogue "Never Cornered" of the Bullard Automatic Wrench Co., 257 West Exchange street, Providence, R. I.

Industrials.

Rapid-Economy Stamp Mill Co., of San Francisco, reports the sale of a number of its stamps to L. A. Hughes of Durango, Mexico.

Mr. Robert Schorr, of San Francisco, is to build a second briquetting plant for the Western Fuel Co., of that city. The plant will have two presses, with a capacity of over 300 tons in 24 hours.

The Chicago Pneumatic Tool Co., states that arrangements are now under way for increasing the capacity of its compressor works at Franklin, Pa., so as to give them an annual output of between 650 and 700 compressors.

The Robbins Conveying Belt Co., of New York, has recently opened an office in the Frick building, Pittsburg, Pa. Mr. G. R. Delamater, resident engineer, is prepared to receive inquiries from the vicinity of Pittsburg relating to conveying and hoisting machinery.

At the annual meeting of the Parson Manufacturing Co., the following officers were elected: H. E. Parson, president; G. L. Prentiss, vice-president; H. T. Parson, 2nd vice-president; H. M. Parson, chief engineer; C. H. Parson, secretary and treasurer; S. H. Parson, assistant secretary. The company is the manufacturer of the Parson system of furnace construction.

The Westinghouse Machine Co., of East Pittsburg, Pa., reports having recently sold 6,130 h. p. of its various types of steam engines, the largest order being from the Illinois Steel Co., Chicago, Ill., for one 38 and 76 by 54 vertical cross-compound Corliss engine of 3,000 h. p. capacity. Of the other types of engines manufactured by this company there were sold 1,720 h. p. of standard, 1,150 h. p. of compound, and 260 h. p. of junior.

The Sullivan Machinery Co., of Chicago, reports the appointment of Mr. H. T. Walsh, as manager for the Pacific Coast, with headquarters with Henshaw, Bulkley & Co., at San Francisco. Mr. Walsh has had an extended experience with mining equipment, having represented the Sullivan Machinery Co. in the Rocky Mountain region for a number of years. Henshaw, Bulkley & Co., who have been for a long time the agents of the Sullivan Machinery Co., will continue to carry a stock of Sullivan rock drills and compressors.

Construction News.

Ward, Colorado.—The Golden Slipper Mining and Milling Co is considering the erection of a new stamp mill on the Puzzler group, near Ward.

Yreka, California.—At the Blue Gravel mine in Greenhorn district, near Yreka, pumps and a hoisting plant are to be installed. W. T. Cope, Grant's Pass, Oregon, is owner of the property.

Hot Springs, North Carolina.—The Hot Springs Manufacturing Co. will open a barytes mine and put up a mill to prepare the mineral for market. Frank Liebrock is president.

Centerville, Tennessee.—The Centerville Phosphate Co. is arranging to open a phosphate mine, and will need machinery. John W. Fry, Columbia, Tenn., is president.

Sweetwater, Monroe County, Tennessee.—The Philadelphia Zinc Co. proposes to put in machinery and work zinc ores. Charles H. Brown, Knoxville, Tenn., is general manager.

Cascade, Colorado.—The Cynosure Gold, Silver and Copper Mining Co will put in a new plant, for crushing and concentrating ore. The company's office is in Georgetown, Colorado.

Wall Street, Colorado.—The United States Gold Corporation expects to run a tunnel 1½ miles into Sugar Loaf Mountain, and will put up a large power plant. J. Monroe, of Boulder, Colo., is manager.

Saltner, Colorado.—The Marquette Gold Mining & Milling Co. is arranging to build a tramway 500 ft. long from the mine to the mill. W. B. Leveque, of Boulder, Colo., is manager.

Conconully, Washington.—The Mineral Hill Mining and Tunnel Co., at Conconully, Okanogan county, Wash., is talking of installing a power drilling plant and driving a new tunnel. The company's address is as above.

Baker City, Oregon.—The Matoon mine is arranging to put in a 10-stamp mill. Mr. Butler, of Baker City, is manager. It is proposed to build a smelter in Baker City. Messrs. Conrad & Curtze, of Erie, Pa., are interested.

Houghton, Michigan.—The Lake Copper Co. has been formed to reopen the Belt mine in Ontonagon county. Diamond drilling and operations in the old workings are planned. Reginald C. Pryor is president and resides at Houghton.

Lake Linden, Michigan.—The Calumet & Hecla Mining Co., with offices at Calumet, is installing a large electric power plant at Lake Linden and plans to replace steam, the present motive power, by electricity in the various departments of the mine. Electric pumps, trams, etc. will be required.

Calumet, Michigan.—The Tamarack Mining Co., together with the Osceola Consolidated Mining Co., both of which are under the Bigelow management, have under consideration the direction of an electrical power plant on Torch lake and the abolishment of steam as a motive power in the mines and stamp-mills. Offices are located at Calumet, Michigan.

The Osceola Consolidated Mining Co. plans to erect a large compressor at its old Osceola branch this year. W. J. Uren, Calumet, Mich., is superintendent.

Special Correspondence.

San Francisco. Jan. 17.

The Panamint mountains, near the head of the Goler cañon on the Death Valley side, are to be the scene of a great deal of substantial development work in the near future. The most encouraging sign in this region is that Philadelphia and other Eastern capital is being placed, and at present there is such activity in the Panamint country and Slate range that the work of the past year really represents more ore uncovered than has been done for the previous eight years altogether.

The recent long spell of cold weather has greatly interfered with the business of hauling traction engine trains between Milton and Copperopolis, Calaveras county, and the smelters at Copperopolis have been closed for three weeks because of the inability of the transportation company to deliver fuel oil in sufficient quantities to operate the plant. The smelters were started up about a month ago and ran 10 days, when the oil supply gave out, and the traction engine could not make the trip of 15 miles from the railroad station at Milton to the copper town. The smelters were turning out plenty of copper, everything was prepared for a long run, but the weather spoiled the business for a time, and it is feared the oil supply cannot be kept up until after the rainy season has ended.

The Copper King people, of Fresno county, formerly used traction engines between Clovis and the railroad, but the farmers objected so strenuously that the company has gone back to the use of teams. This mine is now being worked under supervision of Trustee Geo. W. Ade, and the claims against it are being paid off. On Sept. 8, a dividend of 10% was paid the creditors, and in a few months there will be another 10%. All the preferred labor claims have been paid. When the trustee took hold of the mine it was full of water and the machinery had been neglected, but the mine is now on a paying basis again.

The South Yuba Mining and Smelting Co., of Nevada county, has not bonded its copper mine as reported, as the stockholders are convinced they have a good proposition. Ore has been shipped for tests in order to determine the best method of working it.

The Mountain Copper Co., with mining property in Shasta county, has established auxiliary smelting works near Martinez, on the shore of San Francisco bay, where about a million dollars has already been expended. The sulphurous fumes are condensed and sulphuric acid is being manufactured. The company is also making a fertilizer which will shortly be placed on the market, satisfactory tests with it having already been made. At the new plant both sea and rail transportation are available.

No saloon may be conducted within Shasta county nearer than 1½ miles to a mining or logging camp where 25 or more men are usually employed, unless the saloon is within the limits of an incorporated town. That is the most important change made by the Supervisors in a county liquor license ordinance just passed unanimously. The ordinance was enacted to meet the requests of lumbering and mining companies that want to keep the grog-shops away from their camps. The new law also provides that roadhouses in the county outside of incorporated towns may be established only on the petition of 10 reputable householders living within a radius of three miles of the saloon. The three-mile limit establishes the "vicinity," Saloons must not do business for a day without a license.

The North Star Mining Co., of Grass Valley, has inaugurated a trolley line on its new property which is an innovation in that mining section. The road is 2½ miles in length, including all sidings. The track is 20-in. gage, with two overhead trolley wires. It connects the Central and North Star mines, besides running to both mills, the big cyanide plant on Wolf Creek and the machine shop. Ore will be hauled from one mill to another as required, thus doing away with the teams which have been in use so long. When running at full capacity the road will haul 250 tons of ore a day, in addition to the sulphurets from both mills to the cyanide plant, and all machinery and material between the mines. Fifteen cars will constitute a train, each car having a capacity of two tons. The road passes through a tunnel under the North Star dump, winds about hills, over long trestles, crosses deep ravines, and required much engineering skill. It is the result of superintendent A. D. Foote's idea. Two 30-h. p. motors furnish the power.

The 40-ft. dam of the Socrates Quicksilver Mining Co. at Pine Flat, Sonoma county, has been carried away by the high waters.

The California Petroleum Refineries, whose purchase of the plant at Rodeo, below Port Costa, on the bay shore, some months ago aroused quite a little speculation, have been preparing plans for the overhauling and enlarging of their new holdings. The company has a capital of $1,000,000, divided between San Francisco and London, and has secured a two years' contract with the Graciosa Oil Co. for the delivery of between 1,500,000 and 3,000,000 barrels of crude oil a year.

The Redding Gold and Copper Co., which has spent much money on its property at Clear Creek, seven miles west of Redding, Shasta county, is putting in a solid masonry dam. For a mile below this the creek will be worked for the gold that is in its bed, and at the point where the water by flume

will be put back into the river, a power plant for generating electricty will be built. The electric energy will be furnished to the neighboring mines, and will also be used in connection with a custom smelter of 500 tons capacity that will be located just north of the Igo bridge. The contract for the installation of this machinery has already been placed, and the work will begin early in the spring.

Bisbee. Jan. 18.

The fifth furnace of the Calumet & Arizona mine will be made ready for operation as soon as possible. With this ready, four furnaces will be maintained in operation continuously, and the company's copper product will approximate 6,000,000 lb. per month, which will be from the various mines of the Cole group. The company is making plans, which are yet incomplete, for a very large new smelting plant, which will ultimately be arranged to treat the ore from all the shafts of the Cole group of mines.

Dec. 1 the Calumet & Arizona showed a surplus, in cash, copper, bullion, supplies and money loaned, of $2,927,000. Out of this has been paid $500,000 in the December dividend, and to it is to be added the earnings of December, estimated at about $325,000, for it is still delivering copper on sales made 90 days ago, so that the year's end sees the company with a surplus of about $2,700,000. Of this about 13,000,000 lb. is in copper, valued at 14½c., and in silver at 55c. an ounce. This company has charged off all betterments, furnaces, and the like, and shows none of them in its assets. Its actual earnings for the three years of its smelting copper, therefore, are considerably more than the present surplus and the $3,400,000 of dividends paid.

Calls on partly paid stocks in this district are quite the style now. Denn has made a call of $2.50 payable in January, Chiricahua has called $2, payable the same month; Manhattan has called $4, payable at once, and there are some others coming. The Manhattan call is announced to be "because of the excellent showing at the company's mine it has been determined to pay for the ground at once," and not await the expiration of the bond.

Adjoining the Manhattan ground in the Chiricahua mountains is the Sullivan property, which is owned in Duluth, Minn., and for the development of which a company is being organized, to be called the Sullivan Copper Development Co., capitalized at $500,000 in $10 shares. Of these 10,000 have just been allotted and sold, and the first call of $2.50 was paid Dec. 27 at the Duluth office. The company has some development work done during the past two years, which looks very well, and is to carry this forward as fast as possible. Persons identified with the Shattuck are in control of this group.

In the Wood cañon, in the Chiricahuas, the Taylor tunnel has run into a bunch of ore carrying copper, gold and silver in considerable quantity. As the result it may be this property and the Empire State may be consolidated and a tunnel driven, cutting the Taylor at about 700 ft. from surface.

At the Lake Superior & Pittsburg mine drifts and crosscuts on the 1200 ft. level will be driven into the orebodies south of the Cole shaft, which are now being stoped on the levels above. In about 90 days the plat on the 1,300-ft. level, to which the shaft is now sinking, will be cut and a station made. It is probable that the mine will make more or less water at this depth.

On the 700-ft. level of Shattuck the drift which was turned to run parallel with the main fault, as it cut into porphyry, is now started again and is in rich ground ahead of its former breast. It is proposed to run this drift straight to the Leo and Roy claims. Shattuck has 2,100 ft. of the Czar fault.

The Saginaw mine has cut copper ore on the 700-ft. level, though as to its value no one can yet state. The shaft is down 900 ft. and is in ground that looks very well. This property is proving the values of Denn, Junction and American, and in its success they all share.

Copper Queen has started to drift across its Cuprite claim, from the 200-ft. level of the shaft of that name to the Shattuck ground, where it will connect with the Shattuck shaft on the 400-ft. level. This drift will prove the general character of the ground running along and across the Czar fault for a distance of nearly 1,000 ft., and should be a very important project. The Queen is smelting about the same tonnage of ore as for the past month, and its December product is understood to be running up to a trifle better than 7,000,000 lb. Its newest furnace in the Douglas smelter is not yet in operation, but is expected to blow in during the month, when the capacity of the works will be slightly increased. The company is making extensive betterments at the smelter.

Denn shaft is down 800 ft. and is in ground that presents some difficulties. It is more soft, carries some manganese and copper stains, and has much more water than formerly. The approach of ore is evident, but it is quite likely that there will be water trouble before it reaches the copper zones.

Salt Lake City. Jan. 17.

According to the annual report of State Coal Mine Inspector Gomer Thomas, the total production of coal in the State during 1905 was 1,602,528 tons, an increase of 39,254 tons over 1904. The output of coke was 215,712 tons, an increase of 30,695 tons.

The coal production of 1905 was distributed among counties as follows: Carbon, 1,444,565 tons; Summit, 74,911 tons; Sanpete, 4,202 tons; Emery, 3,500 tons; all other counties, 75,350 tons. The value of the coal produced is figured at $1,890,982, while the average cost of mining and loading onto cars at the mines was $1.18 per ton. The report shows that employment was furnished to 1,963 men, and that they worked 2,376 days. Only seven fatal accidents occurred and the number sustaining serious injury, from various causes, did not exceed 36. In the operation of the mines 150,642 lb. of powder and 83,692 lb. of dynamite were used. The total number of coke ovens in operation was 754.

The coal mines have been working to the limit of capacity of late, and notwithstanding this, the State has experienced a coal famine, and for several weeks the problem of supplying fuel in sufficient quantity has been a serious one. The railroads are partly to blame for this condition. During the summer of 1905, nearly all the available motive power was used in the movement of passenger trains, the roads neglecting to stock up with a winter supply for company account. The mining companies, at least some of them, cut their forces. But when ready to start up full blast, they found a scarcity of labor. The unusual activity in the metal mining camps, the construction of new mills, smelters and railroads created a demand for labor in other fields.

The Pittsburg-Salt Lake Oil Co. has secured deeds to 63 oil claims located near Colton in Spanish Fork Cañon.

The Mountain View mine. in the Tintic district and adjoining the Yankee Consolidated, is now a dividend payer. The initial distribution of 2½c. a share, or $3,488, will be made January 15.

The Carisa and Mammoth mining companies operating in the Tintic, have settled a long-standing dispute over a bill for water rental rendered by the latter. The account has been allowed by the Carisa Co. The contract has been renewed and the Carisa compressor plant is in operation again.

One of the steam shovels to do service on the property of the Utah Copper Co., in Bingham, has been shipped from the factory. It is expected to reach Bingham about Feb. 1.

James McGregor and associates, owners of the Magnolia and St. Louis lode mining claims at Park City, and who claim the Silver King Mining Co., has trespassed on their property and extracted ore of the value of more than $1,000,000, have ground cleared for a new shaft, in the sinking of which, they expect to prove their contention.

At the annual meeting of the Lower Mammoth Mining Co., operating in Tintic, H. G. McMillan, A. C. Ellis, Jr., W. S. McCornick, Simon Bamberger, Timothy Egan, John Dern and A. Reeves,

all of Salt Lake, were chosen directors. The executive committee made a report, in which it was stated the mine is again paying its way and making some money. The indebtedness of the corporation has been reduced from $20,000 to $15,000.

The fact was brought out at the annual meeting of Butler-Liberal shareholders that this Bingham property has an indebtedness of about $6,000, which will be liquidated by assessments. The new directors of the company are: J. J. Corum, N. D. Corser, C. N. Strevell, L. D. Lee, Dr. E. D. Hammond, L. H. Curtis and F. M. Ovem, all of Salt Lake.

The American Ozokerite Co. has been made defendant in a suit brought in the Federal court by Richard J. Kroupa, of Provo, Utah, who claims to be the rightful owner of 160 acres of ground for which the defendant company has, through its agents, secured patents. Kroupa asks for possession of the property.

For a consideration of $15,000, Jesse Knight, of Provo, Utah, has purchased the Iron Blossom and four other patented lode mining claims in the Tintic district.

The Utah Smelting Co., organized recently to build and operate a smelter near Ogden, Utah, is letting contracts for material and equipment. Tracks connecting with the Oregon Short Line and the Ogden & North Western railroads are being laid. Bela Kadish, vice-president and manager, says the company will be buying ore within the next 90 days. It is the intention to put in a lead stack. David Eccles, of Ogden, is president of the company.

Tonopah. Jan. 21.

It is reported that the Schwab-McKane Co. has taken an option upon the Blair silver mine at Silver Peak, about 30 miles west of Tonopah, for $750,000. The mine has not been worked for many years. Its production when first opened amounted to about $7,000,000.

Tonopah Extension has made a long-term contract with the American Smelting & Refining Co., under which restrictions have been removed and terms made that are entirely satisfactory. The January output will be at the rate of 100 tons a day, or double the output of the December quarter, and arrangements are being made to increase the output to 200 tons a day. Manager Gilles has been in conference with C. M. Schwab and other large owners in New York, at which it is understood plans were agreed upon for the increased production of this and other mines, control of which is held in Pittsburg.

In 1905 Tonopah mining companies paid dividends aggregating $1,300,000, divided as follows: Tonopah Co., $1,000,000; Tonopah Extension, $150,000; Montana Tonopah, $100,000; Tonopah Midway, $50,000.

Ore shipments from the Tonopah camp in 1905 were 82,495 tons, having an aggregate gross value of $4,500,000 and divided as follows: Tonopah Co., 46,870 tons; Tonopah Extension, 17,183 tons; Montana Tonopah, 9,518 tons; Tonopah Belmont, 6,063 tons; Tonopah Midway, 2,265 tons; North Star, 490 tons; West End, 106 tons.

Ore shipments over the Tonopah railroad last week were 1,529 tons, divided as follows: Tonopah Co., 762 tons; Tonopah Extension, 342 tons; Montana Tonopah, 132 tons; Belmont, 185 tons; Midway, 32 tons; West End, 38 tons.

A large number of oil claims have been staked on Indian creek, near Los Vegas. Indications of oil are good and it is expected that an extensive oil field will be developed. Prominent Tonopah capitalists have acquired holdings.

The Montgomery-Shoshone litigation having terminated, many new prospecting and developing operations are being started. It is expected that the new year will witness great activity throughout the Bullfrog district.

A great deal of work is being done in the vicinity of the Montgomery-Shoshone. The Steinway has a shaft down 170 ft. and lately has cut some stringers of good ore.

The Providence has 400 ft. of development work, and the company is prospecting diligently for the extension of the Shoshone ledge.

The Lucky Jack is down 100 ft., with 85 ft. of crosscutting. This is another company after the continuation of the Montgomery-Shoshone vein, and during the past week some ore was taken from the face of the crosscut that is, in appearance, identical with that of the famous mine. Some of it pans big, and the assays now received are higher than ever before, and the management is confident that the ledge so long prospected for will be encountered at an early date.

Leadville. Jan. 19.

Ore has been struck in the Mammoth shaft, Big Evans gulch, and the shaft went through 5 ft. of mineral when work had to cease on account of the flow of dolomite sand which clogged the pumps. This is now being remedied by using heavier pumps and supplying the shaft with boxes to catch the sand; when this is accomplished sinking will be resumed and the shaft sent below the second body of ore found by the diamond drill, which is 25 ft. below the first ore-shoot. The strike is an important one for the district, as it was long the belief of mining men in general that the ore-shoots of Carbonate hill did not trend as far as the flat of Big Evans gulch. Now that the mineral is caught it will be the means of opening this section of the camp and also that of Canterbury hill to the north. On the latter hill nothing but surface work has been done, and the finding of some iron in a number of properties.

In the strike in the Mammoth it has again been proved that the ore-shoots of the district trend northeast and southwest. The ore found is a sulphide, heavy in lead. The Mammoth people have secured control, under lease, of the Pawnolas group, to the west and this ground will be thoroughly prospected this summer.

The activity on Rock hill is still unabated, and fresh vigor has been instilled into the center by the opening of mineral in the Bessie Wilgus, south of the Reindeer. For the last two months prospecting in the immense body of porphyry has been carried on, but with no success. Manager Estey came closer to the shaft the southeast, and started work on a streak of ore in the altered lime; this he followed with an upraise which ultimately led to the orebody; he worked on the shoot for two weeks before giving the strike out. The shoot is being developed and already several carloads of ore have been shipped. Mr. Estey is now confident that he has struck the extension of the Reindeer, as the ores from both properties are identical.

The Nil Desperandum, to the west of the Bessie Wilgus, has been doing considerable prospecting work during the last few months, but so far without results. Both the north and south drifts have been driven a little over 600 ft. from the shaft; the former is in black lime with stringers of ore all through it; in the south drift a different condition exists, as it has been driven on a water course, with the finding of several pockets of ore. The whole breast is heavily mineralized. The stringers of ore in both drifts dip back to the shaft and the management has decided to change the mode of operations, believing that the drifts are beneath the ore zone. Upraises will be started at once and the probabilities are that the ore channels will be opened in both north and south.

Four years ago George Grogan sold a group of claims in Pine Creek, a few miles below Granite, to a New Jersey company, and when the company started work he suggested where the operations should be carried on. The management did not agree with him and carry out its own ideas, with the result that after working for over two years without results the company became discouraged and quit. Grogan got possession of the property on the first of the year and started work carrying out his own ideas; after working a few shifts and driving 12 ft. he opened up a vein of ore 3 ft. wide that runs high in bismuth and also in gold and silver. The ore is being sacked.

The Cloud City, down-town section, is getting into position to ship 50 tons daily of manganese ore from its territory. In the Home Extension ground a body of this class of ore has been opened for several hundred feet and it is 12 ft. wide; in two separate points in the Cloud City territory good bodies of manganese have been opened.

The Ophir tunnel, South Mosquito gulch, has caught the extension of the London vein to the southeast. Last week a heavy flow of water was encountered at the breast, and after the necessary work was done to take care of the water, driving was resumed, and in a few feet the ore was opened. In character it is the same as the London, a sulphide mixed with iron and quartz, and carrying its highest values in gold. This is the first time that the London vein has ever been opened to the south.

Cripple Creek. Jan. 18.

The annual meeting of the Cripple Creek District Mine Owners and Operators' Association was held this week, and the following gentlemen were elected members of the executive committee for the ensuing year: Wm. Bainbridge, of the El Paso mine, Austin Holman, Golden Cycle, C. W. Howbert, Anchoria-Leland, Nelson Franklin, Eagle Ore Co., and Sam McDonald, of the Strong and Gold King. The first three were members of last year's committee. A meeting will be held soon in this city to elect a president and secretary.

The annual meeting of the Acacia Gold Mining Co. was held this week in Colorado Springs, and, as was expected, the McKenzie and McDermid faction won out. Mr. McKenzie was elected president and general manager and Mr. McDermid secretary and treasurer. A new lease has been granted on the south end of the Burns claim of this company to the Clark Leasing Co., and the work of preparing to sink the shaft has commenced. This is to be put down immediately to a depth of about 750 ft., where it is expected to cut the rich Shurtloff ore-shoot.

The lessees on the Forest Queen on Ironclad Hill, are preparing to install a six-drill air compressor to furnish air for this property and also for some of the neighboring mines.

The deal by which the majority faction of the Golden Cycle stockholders were to exchange the control of the stock in the Independence Consolidated for the stock of the minority of the Cycle has been consummated, and now a deal for consolidating the Hull City placer of the Independence Consolidated, is about made. The Vindicator Co. offers 400,000 shares of its treasury stock for 2,000,000 shares of the stock of the Independence Consolidated, which is at the rate of one share Vindicator for five Independence. This offer has been accepted by the majority of the Independence stockholders. The Vindicator Co. also wants to buy the remaining 500,000 shares of the Independence Co. and will cancel the stock.

The new cyanide plant in Pony Gulch was burned to the ground a few days ago. The mill has never been run, but was almost in readiness to begin business. It was designed to treat some low-grade ore claimed to be found in Pony Gulch. There is some talk of the mill being rebuilt.

Denver. Jan. 19.

The State Supreme Court issued a supersedeas last Saturday, staying the judgment of Judge Owers, who had issued an injunction restraining the mine owners of Leadville from discriminating against members of the Western Federation of Miners in their employment of men.

A number of Denver and Leadville citizens will probably contribute to the erection of a bronze statue of the late August R. Meyer, at Kansas City, where the Commercial Club intends to raise $25,000, for the purpose. Although his last few years had been spent in that city, Colorado has not forgotten how, realizing the future of Leadville, he poured money and strenuous energy into the district, where he gave the first impetus to the smelting business.

Mr. B. J. Arnold, electrical engineer, has been here for some time investigating the situation in regard to the use of electric motive power for the Denver & Rio Grande railroad system and has just retuned East to complete his report. There is an enormous amount of water power constantly going to waste in our mountain streams which could be used to good advantage for the generation of electricity, and the steep grades at a number of points will be no bar.

The Victor Fuel Co., controlled by John S. Osgood, is at present the second largest producer in Colorado and by an aggressive policy is getting a large amount of business formerly handled by the Colorado Fuel and Iron Company.

Butte. Jan. 16.

The strike of teamsters engaged in hauling ore in Butte has been settled for the present and the men have returned to work. The trouble occurred on Jan. 1 and lasted 11 days, during which time no ore was removed from any of the small mines, and some of the larger ones, including the Cambers, with an output of 130 tons a day, and the Gallatin with an output of 125 tons, both Amalgamated mines. Concessions were made by both sides. Since the settlement operations have been resumed at all of the mines from which ore is transported in wagons. The strike also caused a suspension at the Lexington, a United Copper property, and the plant of the Montana Zinc. Both are again running.

The fire which broke out in the East Colusa mine on Jan. 8 has been entirely extinguished, but workmen are digging out the old timbers in order to be sure that no sparks remain. The blaze occurred on the 300-ft. level west of the shaft, but did not interfere with the operation of the mine. It is supposed to have been caused by spontaneous combustion. The mine is owned by the Boston & Montana.

North Butte is producing between 800 and 900 tons of ore a day, and Raven is extracting 100. The latter will begin its crosscut from the 1,500 of the Buffalo this week and expects to intersect the three copper veins of the Snoozer inside of 60 days.

East Butte Copper is arranging to sink the shaft of the Dutton 1,000 ft. It is now 350 ft. and is of two compartments, but another compartment will be cut to the surface and the shaft made uniform in size the entire 1,000 ft. This will be the deepest shaft in that section of the district, the Belmont being 900 and the Glengarry 800 ft., both United Copper claims.

Pat. Clark and others are organizing a company to operate in this district. Mr. Clark lives in Spokane, but has owned valuable interests here more than 20 years. These interests have been pooled with others.

Clarence B. Wisner, manager of the property of the Montana Zinc Co., has taken an option on 200,000 shares of Southern Cross stock and gone east to interest capital in the property. These shares represent the holdings of Lee Mantle and H. L. Frank. The mine is in operation under the management of Lucian Eaves, who holds the remainder of the shares. The property is a gold producer. During the last 18 months it has yielded $262,000 without continuous operation.

Pittsburg & Montana will make another shipment of copper this week. It is now mining between 125 and 150 tons of ore a day, which is sufficient to keep its smelter in operation. The plant was out of commission three days last week, on account of an accident to the converter. The new shaft is going down rapidly, nearly 100 ft. having been sunk.

Reins Copper has cut its station at the 1,000 and will resume sinking this week. It is going to the 1,200 before crosscutting. A large pump has been installed at the 1,000 and another will be placed at the 1,200. The flow of water is only 400 gal. per minute.

Duluth. Jan. 18.

One of the most important purchases ever made by the Oliver Iron Mining Co. for the United States Steel Corporation, has just been closed. It is a half interest in the fee to the lands on the western Mesabi range owned by Mr. T. B. Walker, of Minneapolis. The price has not been stated; in the nature of the deal it cannot be for some time to come, but it may reach several million dollars. Mr. Walker's lands lay almost entirely within the limits of township 56, range 24, Itasca county, in a portion of the Mesabi, range that a few years ago was thought to be without much value, but which has proved up tre-

mendously in the last two years. T 56-24 has been found the best part of the western range, and contains a great many million tons of ore, much of it of good quality.

During the career of the Steel Corporation there has not been a year in which it has not bought far more ore in the ground than it has taken out. Notable purchases it has made have been the Chemung and Canisteo leases, on the Mesaba range, which added more than 150,000,000 tons to its reserve; the Union Steel Co.'s mines; the Clairton mines; large tracts in the Palmer and Swanzey districts, Marquette range; and several others, as well as many single leases, fees and small groups. These have replaced, many times over, the 70,000,000 tons that have been mined by the Corporation during its existence.

The closing of the deal for the Walker lands marks the beginning of 1906, though the deeds were signed in the last days of 1905. Little exploration has been done on these lands aside from a comparatively few holes that have been driven by the Great Northern Railway, and holes on adjacent lands sunk by the Grand Rapids Exploration Co. and other Congdon-Hartley companies. The amount of ore to be proved there cannot be approximated, except to say that these adjoining holes seem to indicate that there may perhaps be up to 150,000,000 tons on the Walker lands. But the Steel Corporation gets only half of this total, unless it can make some deed of partition with the Great Northern road. The latter was a purchaser of a half interest in the Walker lands two years ago, before the value of this part of the Mesabi range was apppreciated, indeed before there had been sufficient exploration there to determine to any degree of accuracy that the ore was good for anything. For this undivided half-interest Mr. Hill paid about $200,000. His purchase contains much of the total ore he is able to lease to any company, indeed it is possibly well toward a majority of all he has now open for lease.

The Steel Corporation is a tremendous owner of ore lands in T 56 R 24. Combined with the Great Northern holdings, the whole formation is taken in; there is nothing outside except one or two small tracts, one of which belongs to the Watsons, of Minneapolis. In this district is the Arcturus mine, a Steel Corporation property that belongs in fee to St. Cloud, (Minn.) people. There is also the Diamond, formerly a Minneapolis tract, and the Buckeye, also at one time a Minneapolis lease, and belonging in fee to the State. Other lumbermen of Minneapolis, Messrs. Morrison, Pillsbury, and others, were owners of land in this town, all of which has either been sold or leased to the Steel Corporation.

Much of the ore to be mined in this section will be of such character that it must be washed and separated from the sand contained in it. But there is a greater proportion of high-grade ore in the district than has been generally supposed. There is much that will run well up in iron and so low in phosphorus as to be within the bessemer limit. It is understood that the Walker sale includes, as ore, two classes of material, the first that which will run better than 57% in iron, and the second, that which runs below 57% and above 36%. This latter class is subject to a reduction of 25% in weight on account of the sand contained therein, to permit washing.

The Steel Corporation is pushing the construction of a railroad to the region, which will cut the district at section 30-56-24, and will have branches along the range from the Arcturus in section 13 to the Buckeye, in section 36-56-25. This road will be in operation the coming season. It is supposed that the ores to be washed before shipment will be assembled at Trout Lake, which is but a short distance from some of the mines, and will be treated there prior to shipment to docks at Duluth. Comparatively little of these ores can be shipped the coming summer.

Platteville, Wis. Jan. 18.

One of the largest mining companies organized recently, is the United Mining Co., which has several hundred acres under lease in the vicinity of Montfort camp, with several drills at work, prospecting the different holdings.

The contractors expect to have the new concentrating plant, at the Consolidated, running in about 10 days. The contractors are men of experience from the Joplin zinc field. The incline shaft is down to the 80-ft. level.

At Montfort camp is the richest pyrite mine in the district, producing from two to six cars per week. It is owned by the Mineral Point Zinc Co., and the product is used at its acid plant.

Another new concentrating plant that will soon be completed, is the Sunset, just east of the Sunrise, at Rewey camp. This mine is said to be one of the best developed in the district.

Messrs. Dolan, Dietzman and Cushman have placed an order with the Galena Iron Works for the complete installation of a hoisting, pumping and compressing plant. The drills located a very rich body of zinc and lead ore on their property. It is located on the old Penitentiary Range, which has yielded a large amount of ore in the past.

The Famous mine, owned principally by W. A. Jones, of the Mineral Point Zinc Co., is making extensive preparations to install pumping and hoisting machinery. It is claimed that the mine is on the Coker range, which has been producing for 30 years off and on, and continuously for the past five years.

The Earl Lead and Zinc Co. has been organized with a capital stock of 75,000 shares of $1 each. Its property is located in Iowa county, half-way between Belmont, Wis., and the Mineral Point camps, and consists of about 50 acres. It was at one time a heavy producer of lead and drybone. The present shaft is down to 60 ft., and it has been established that the lower horizons are rich in zinc ore. The property has been fully prospected, and the main run established. The company is making the necessary arrangements for the erection of a 100-ton concentrating plant.

A strike of rich lead deposits is reported by Messrs. Waters & Miller on the north Cascade Road, near Dubuque. in the vicinity of the Old Pike's Peak range. The installation of modern pumps has made it possible to get down below the old water level.

The Enterprise, St. Rose and Empire, all in the immediate vicinity of Platteville, declared their usual semi-monthly dividends.

The Hibernia mine, in the center of the Platteville camp, is ready for a concentrating and separating plant. Drifts extending 350 ft. east and west, at a level of 165 ft. have been crosscut some 150 ft. north and south.

The Great Northern Mining Co. held its annual meeting the early part of the week, and elected Fred Krog president. It is hoped to have the ground sufficiently opened by spring so as to keep a mill running. The orebody has been located, and it only remains to open up the ground properly.

An old lead mine, in the vicinity of Galena camp, which has been in operation for over 20 years, passed into the hands of Rockford parties recently.

Calumet, Mich. Jan. 20

No. 1, 2 and 5 shafts of the Tamarack mine have been sealed at surface, and the officials of the company expect to smother the fire which broke out in an abandoned stope at the twenty-second level of No. 2 shaft. While there is a large quantity of timber where the fire started, it is not believed that the flames can spread. No. 2 shaft, in which the fire started, is 4,400 ft. deep and the richest portion of the mine. It had been shipping 1,000 tons of rock daily. Owing to No. 1 and 5 shafts being connected with the burning shaft, and the gases formed in the latter penetrating those workings, it was deemed advisable to seal them at surface. Every means of ventilation has been cut off and the fire should exhaust itself soon. No. 1 shaft was shipping a small amount of rock from the Osceola amygdaloid bed, reached by crosscuts from the conglomerate, which was exhausted some time ago. No. 5 shaft furnished a large output of rock of a good quality.

The North Tamarack branch, which consists of No. 3 and 4 shafts, is not connected with the portion of the mine afire, and is operating with an increased force. About 50 men, who were formerly employed in No. 1, 2 and 5 shafts and have families, were transferred to No. 3 shaft. This shaft has two cages for the hoisting of rock, but the cage ordinarily used for tools and supplies will be used for hoisting rock. The normal daily output of the shaft is 1,000 tons, but it will be increased somewhat by the new arangements. Some of the men employed in the surface work about No. 1, 2 and 5 shafts have been laid off until operations are resumed.

Three of the Calumet & Hecla company's shafts on the Osceola amygdaloid bed are producing now. Rock shipments are being forwarded from No. 13, 14 and 16 shafts. No. 15 is still inactive, but it is likely that operations will be resumed at that point in the near future. No. 17, the northernmost opening of the Calumet & Hecla on the Osceola lode, is not expected to resume work, as the hoisting engine used in sinking that shaft has been moved to another point. In its Osceola amygdaloid operations the Calumet & Hecla drives drift stopes to the full width of the lode and about 12 ft. in height. This provides an adequate supply for the stamp mills and in addition furnishes a thorough test of the formation's copper-bearing values as the work advances. Accurate estimates of the possibilities of the stoping ground blocked can be formed. In extending the drift stopes the work follows the lode in all its twists and turns, thus keeping the openings in productive rock and eliminating the penetrating of barren ground.

Sinking in No. 6 shaft of the old Osceola branch of the Osceola Consolidated Mining Co., is under way below the 43d. level. There is a large area of undeveloped ground tributary to this shaft on the south, and important developments are expected when drifts are started in that direction on deeper levels. It is planned to install a compressor of large capacity this year. No. 5 shaft, the only other active shaft at the old Osceola, is not sinking, but furnishes a good rock supply, the daily production of the two shafts being 1,000 tons.

It is planned to start production at the Victoria mine in Ontonagon county in March. Work on the power plant and stamp mill is well advanced.

The name of Walter Fitch, of Salt Lake, Utah, who recently resigned as general manager of the United States Mining Co., has been connected with the Keweenaw Copper Co., which has extensive railway and mining interests in Keweenaw county. According to report, Mr. Fitch will be appointed general manager of the concern. Mr. Fitch was prominently identified with the iron-mining industry in the Lake Superior district before going to the West, resigning the management of the Clairton Steel properties to assume charge of the United States Mining Co. properties in Utah and California.

Active work on the old Belt mine in Ontonagon county, acquired by the Lake Copper Co., with headquarters at Houghton, Mich., started this week. The old shaft on the Knowlton property will be cleaned out and sinking started. Diamond drilling will also be conducted on an extensive scale.

Birmingham. Jan. 21.

At a meeting of the Alabama State Mining Board held recently in this city, steps were taken to discourage the use of powder and dynamite in shooting down coal from the solid.

A few years ago, it was pointed out, the miners mined their coal more than they do now. Today powder and dynamite are looked to extensively to bring down coal. The mining of coal minimizes the danger in the avocation, it is asserted, and to lessen the danger the mining board is making the effort to discourage the use of powder and dynamite. The State Mine Inspector will send a circular letter to each mine official and superintendent asking that the miners be instructed to mine the coal instead of shooting it, as is now done. Of course, it will not be possible to stop the use of powder and dynamite altogether, but the tendency to depend on blasting rather than mining is growing.

A number of accidents have happened from the extensive use of powder and dynamite, while the amount of coal mined has not increased in the proper proportion, comparing the number of men now employed to that in the business of a few years ago. It is believed that these circular letters will have some effect.

In Alabama, while all the coal is bituminous, there is much soft coal and considerable coal which is harder. The miners in the hard-coal section assert that they must use powder and dynamite extensively. However, it has been shown that good mining will eliminate the use of explosives on the large scale heretofore practiced.

Scranton. Jan. 22.

The new year opened in a brisk manner in the Lackawanna and Wyoming valleys of the anthracite region, and it is a rare occurrence for any of the mines in those sections to be idle even one day. This is regarded as unusual, in view of the extreme mildness of the weather.

Reports are current in the region that the conference between the anthracite operators and the miners is to take place on Feb. 15 in New York.

The large breaker of the Mayland Coal Co., near Tamaqua, was destroyed by fire last week, involving a loss of $80,000 and throwing 500 men and boys out of employment. The breaker will be rebuilt as soon as possible.

According to the reports submitted at the annual convention of the United Mine Workers, the total paid-up membership in the anthracite region is as follows: District No. 1, 43,922; district No. 2, 89,549; district No. 3, 27,019.

The Bear Ridge Colliery corps has been awarded the medal by the Philadelphia and Reading Co. for the highest percentage in competitive drills on first aid to the injured in the Mahoney district.

The machinery for the large washery now being erected at the Beaver Brook colliery arrived last week.

A large force of men is at work in flushing culm in the workings of the Gaylord colliery, near Plymouth, under St. Vincent's cemetery, in order to prevent the graves falling into the mines.

The coal washeries on the Susquehanna river, in and around Auburn, report greatly increased business, and are taking exceptionally fine coal out of the river bed; the work being greatly facilitated by the open weather.

Joseph D. Lloyd, of Wilkes-Barre, last week exploded 6,000 lb. of black powder in the Bluestone quarry, Laceyville, and removed a quantity of earth 60 ft. wide, 150 ft. long and 50 ft. deep. The powder was placed in holes 50 ft. deep.

Indianapolis Jan. 20.

At the close of the first week of the National Mine Worker's convention now in session in this city, little has been accomplished except approving of the officer's reports and parceling out the committee work. The most prominent questions for the convention are: Recognition of the Union by operators of anthracite region and agreement for joint conference; eight-hour day for anthracite miners; Increase of 10% in the general wage scale. Western miners will ask affiliation of the United Mine Workers of America and the Western Federation of Miners. Alabama miners ask for more assistance from the National organization in prosecuting their strike and recognition of Union by operators of the Colorado district.

The anthracite district problem is in several respects the most important and perplexing of any problem before the convention. And while the convention has no jurisdiction to deal directly with that district, it is hoped to throw the influence of the convention in favor of securing joint conference. It is said there is a possibility of the bituminous men refusing to sign a new scale unless the anthracite operators come to the miners' terms. The feeling prevails, however, that the anthracite operators will sign an agreement.

All interest in the convention now centers in the wage-scale, which is to be presented next week by the committee, which has the burden of harmonizing the demands of the miners from the var-

ious districts all over the country. It is believed the committee will decide on an increase in the wage-scale of 12½%, a straight run-of-mine basis in all mines throughout the jurisdiction of the United Mine Workers; a flat differential between pick and machine mining, and the exclusion from the mines of boys under the age of sixteen.

Well informed operators express the opinion that there will be no change in the present scale and that the miners will will be pleased to accept it after their leaders make the customary demand for an advance. The operators say there is more justice in the demand of the block coal district for an increase than there is for the demand of other bituminous miners. The block coal miners work harder for less money than those in other districts, hence their demand will be more carefully considered. It is readily observed that the Indiana miners are not showing a disposition to hunt trouble with their employers, and the prospects at this time are bright for a peaceful settlement. The same conditions exist in Ohio and Illinois. The operators say that if a scale had been made last summer, when the condition of the trade was low, the miners would have accepted a reduction. The present continuous mild winter is another matter to be considered. The operators think the miners are quite willing to hold to what they have now in the wage scale.

The operators will begin arriving next Wednesday and the indications are for an unusually large attendance. Francis L. Robins, of Pittsburg, will be made floor leader again. It is safe to predict that the representative operators from the four big districts will exceed the attendance two years ago by one-half. The miners' demand will be submitted in open joint convention next Friday. The first fight will probably be on the proposition to admit the southwestern States to the conference, making them a part of it. The operators will oppose this. The next contention will be over the increase in wages of 12½%, and the third and perhaps the greatest fight will be on the machine differential.

Sudbury. Jan 12.

The new smelter at Copper Cliff, erected for the treatment of Cobalt ores has been successfully installed and is under the management of Mr. S. B. Wright. The smelter has a capacity of 10 tons per day and is being operated as a custom smelter for the treatment of all precious metal bearing ores. The cost of erection was in the neighborhood of $100,000. Several companies have recently been organized on paper for the treatment of ores from the Timiskaming district, and so far that is all that has been heard of them; the new process monopolist has also been much in evidence, but up to the present the Canadian Copper Co. is the only party that has shown any enterprise and is now doing business in Canada.

The sub-station of the Huronian Power Co., is nearing completion at Copper Cliff. The structure is very substantial, being built of iron and cement. Power will be transmitted from High Falls to Copper Cliff on or about Feb. 1. An estimate of the cost of the power-house and equipment would be $250,000, and it is altogether possible that the figures may exceed that amount.

The *Official Gazette* of Ontario in last Saturday's issue, announces the cancellation of at least 40 mining leases, principally in the district of Rainy river. These leases were granted during 1893 and 1895.

Mr. Thomas Edison, is erecting two camps on his property near Montreal river in the Cobalt district, where he recently acquired two claims.

The Minister of Lands and Mines heard argument by the contestants of a disputed claim situate in the township of Bucke. The prospect is known as the Violet mine. Judgment was reserved.

Captain Lawson, mine superintendent at Copper Cliff, has been promoted to the position of general manager of the Canadian Copper Co.'s entire plant.

The Michipicoten Gold Mining Co. has leased 10 claims in the Michipicoten country and is making arrangements with the Michipicoten Power Co. for sufficient power to operate same. The company proposes erecting a 50-stamp mill and commencing operations about June next. J. J. Heilmann, of Pittsburg, Pa., is the representative of the syndicate.

The Canadian Copper Co. is surveying a right-of-way from Copper Cliff to Creighton to convey power to the property there. The operation of the entire plant by electricity is proposed and plans are now being prepared with this end in view.

Word has just reached here that Provincial Constable Greer has arrived at Cobalt, and ordered every person at present located upon the Gilles Brothers limit to leave under pain of arrest.

Toronto. Jan. 18.

The Canada Chemical Manufacturing Co. has decided to erect at Tweed, in the Marmora mining region of Hastings county, Ont., a plant for making sulphuric and nitric acids from the ores containing sulphur which are found in that area. The works employ about 100 men.

The cement industry is flourishing. The International Portland Cement Co., of Hull, Que., has received orders from the Northwest for 50,000 bbl. for spring delivery. The company has issued a statement showing that the net earnings for the five months ending November 30, were $80,518, being over 8% on the capital.

The following mining companies have been incorporated under the laws of Ontario:

The Dwyer Mining Co., Ltd., capital $100,000; head office, Toronto; provisional directors, John B. Le Roy, Daniel R. Dwyer, and John R. Humphreys.

New York & Canadian Mining Co., Ltd.; head office, Toronto; capital, $40,000; provisional directors, George R. Geary, Fitzgerald D. Byers, and Oscar F. Taylor.

Vermilion River Iron Ore Co., Ltd., Toronto; capital, $80,000; provisional directors: Frank Denton, John W. McDonald and E. A. Francis.

Wendigo Progressive Mining & Development Co., Ltd., New Liskeard; capital, $40,000; provisional directors: John Cox, Samuel D. Eplett, Geo. W. Slade, John W. Foreman and John McFarlane.

Dymond Devedopment Co., Ltd., Ottawa; capital, $250,000; provisional directors: Chas. W. F. Gorrell, Adam T. Shillington, B. J. Arnold, Wayland L. Arnold and Ralph G. Arnold.

Victoria, B. C. Jan. 15.

The public accounts of the Province, just submitted to the Legislature of British Columbia, show the following revenue obtained from sources connected with the mining industry:

	Years to June 30.	
	1903–4.	1904–5.
Free Miners' Certificates	$ 59,855	$ 53,504
Mining Receipts, General	108,271	105,192
Tax on unworked Crown-granted mineral claims	28,696	39,870
Bureau of Mines	831	1,709
Mineral Tax	65,844	114,239
Total	$263,497	$314,512

The total increase last year was $51,015 or 19.4%. The falling off in free miners' certificates indicates that there was less prospecting going on in the province, this class of revenue being derivable chiefly from prospectors. The increase in tax on unworked Crown-granted mineral claims seems to show that either many more claims have been patented or fewer have been worked. The increase of 73.5% in the receipts from the mineral tax, which is a charge of 2% on the value of all metallic minerals disposed of, less freight and treatment charges (and may include a royalty on coal), denotes a substantial increase in the mineral production of the province prior to June 30.

Rossland.—Official information has been received from London to the effect the Messrs. A. J. McMillan, G. W. Wilson, Chas. Dunderdale and T. D. Grimke-Drayton, who received a majority of the votes given at the general meeting of Le Roi stockholders held a few weeks ago, and the regularity of whose election as directors was challenged by the chairman, Sir Henry Tyler, "have been appointed directors and have assumed the responsibilities of the office." The following letter from their legal advisers explains the circumstances under which the two remaining members of the late board resigned and the new board was appointed: "As there appears to be grave doubt with regard to the effect of the legality of the

proceedings at the recent shareholders' meeting, and as the (now unofficial) polling papers, which have been lodged at the office of the company, together with the show of hands and the proxies are in favor of Mr. McMillan, we have advised the directors to accept these circumstances as if they embodied instructions from the shareholders. The board has accordingly dropped the amalgamation proposal, and has today (Dec. 27) passed resolutions electing Messrs. McMillan, Grimke-Drayton, Dunderdale and Wilson, directors of the company, and accepting Mr. Waterlow's resignation. The articles of association confer abundant authority for the election of Messrs. McMillan, Grimke-Drayton, Dunderdale and Wilson, as directors, by the above procedure, which obviates the uncertainty, which, we are advised, would otherwise exist with respect to the validity of their appointment. A board meeting will be held to-morrow at the office of the company, when the resignations of Sir Henry Tyler and Mr. F. W. Rolt will handed in."

The output of ore last week, as reported in press dispatches, was as follows: Le Roi, 1,680 tons; Centre Star, 1,950 tons; War Eagle, 1,020 tons; Le Roi No. 2 (including 1,200 tons sent to the concentrator), 1,620 tons; Jumbo, 200 tons; total, 6,470 tons, making the total for the year to date, 11,590 tons.

Mexico. Jan. 19.

The dispute over the Lucky Tiger mine, some distance south of Moctezuma in the State of Sonora, has at last been settled by the ousting of B. F. Graham and the placing of the property in the hands of the Kansas City Company, which had purchased it from Graham and associates. The property was purchased on payments and at the time the May payment was to be made the Kansas City people had deposited in the Bisbee, Arizona, bank the amount due, subject to the order of B. F. Graham and others, but on the interest quibble Graham, claiming payment should be made in gold and to each individual associate in person, refused to accept the money, and with a special train and an armed body of 12 men, hurried from Bisbee to the mine in Sonora and took forcible possession. He has been working there until the first part of this month, when he was dispossessed and the property returned to the Kansas City Company, which it is believed is closely allied to the Kansas City, Mexico & Orient railroad. The attorney of the latter, D. J. Hoff, together with O. V. Dodge, attended to the legal proceedings against Graham.

The Sonora Bonanza Mining Co., of which W. M. Barker, former superintendent of motive power for the Cananea Consolidated Copper Co., is president, has ore blocked out for a year's work, and is said to have raised money for the erection of a 100 ton reduction plant as soon as the experiments now under way shall have determined the proper treatment.

At San Luis Potosi, in the State of the same name, Compañia Metalurgica Mexicana (R. S. Towne, New York, president) is producing about 200 tons a day of iron ore, well up in gold, silver and lead, from the mines, leased from the Victoria Co., in the famous San Pedro district under the superintendence of B. J. Gates formerly for years with Mr. Towne's interests in Sombrerete, State of Zacatecas.

North of San Luis Potosi, at Charcos, the Tiro General Mining Co., under the general management of J. G. Creveling, is putting in a 10 ton electric zinc separator, built by the El Paso Foundry & Machine Co., for removing the zinc from the low-grade copper ores which the company is now shipping to the Aguas Calientes plants of the American Smelting & Refining Co. On farther north, but still in the State of San Luis Potosi, at Matehuala, the National Metalurgical Co., under the general management of James A. L. Waters, has been smelting now for several months with its 200-ton copper stack and having excellent success.

In the Naica district of Chihuahua it is said that Antonio de Stefano has refused $1,000,000 Mexican, for his Lepanto mines, from No. 2 smelter (the Mexican Company) of Monterey, which has the property under lease and recently made a rich lead strike therein. A new company of Washington, D. C., is preparing to start work in the district, and about 100 miles south of Parral in the State of Chihuahua the Premier, with a capital of £200,000, is surveying a large federal concession of 90 square kilometers (35 square miles) preparatory to prospecting, under the management of E. R. Scott.

London. Jan. 13.

The progress made by the Capillitas Copper Co., which owns properties in Catamarca, Argentina, has been much slower than was originally expected. The company was formed four years ago, under excellent patronage. At the time, I mentioned that the weak point of the proposition was shortness of working capital. Some £495,000 in cash and shares was paid to the vendors and £100,000 was provided for working capital. With this sum it was proposed to build 30 miles of aerial tramway, provide new smelters and develop the mine. The subsequent history of the company proved that this sum was too little, and a year ago it was decided to issue 70,000 new preference shares. The people likely to take them up preferred debentures, so ultimately the new issue was made to suit them. About £62,000 of these debentures have been issued and about one-third of the money has already been paid in. The present position of the company is that the tramway is nearing completion, as also is the new smelter. Your readers may remember that the mine used to be a rich proposition operated by local owners. The ore ran 30% of copper, and was sent by mule to the smelter. After the rich ore was exhausted, the local owners suspended operations, and eventually sold it to the present company. It was hoped that, by liberal expenditure on new plant, mechanical appliances and extensive development, the property would once more become a valuable one, and there is no reason to doubt the correctness of these anticipations. The only drawback in connection with the scheme is the large purchase price paid and the large sum of money required for putting the property on a modern basis. During the past 12 months no regular smelting has been done, but from time to time some of the ore taken out in driving has been treated at the old smelters. Altogether 918 tons were smelted, yielding 79 tons of copper, 6,767 oz. silver and 93 oz. gold, which gives a fair idea of the character of the ore.

That the Le Roi No. 2 mine at Rossland, should continue to show a profit, in fact, an increasing profit, reflects considerable credit on Messrs Alexander Hill & Stewart, the consulting engineers, and on Messrs. Couldrey & Levy, the managers. It is just over three years ago since the mine was put in the hands of Messrs. Alexander Hill and Stewart. The mine was one of the Whitaker Wright fiascos, and after the collapse, many people wished to abandon it. However, the irregular ore deposits have been made to pay during the last three years, the yearly net profits having been $70,000, $150,000 and $215,000, respectively, after all expenses of development and exploration work had been paid. During the year ended Sept. 30 last, 12,237 tons of ore were shipped to the smelters at Greenwood and Trail, averaging 1.184 oz. of gold, 2.318 oz. of silver and 3.62% copper, with an assay value of $35.78. In addition to this 10,678 tons of low-grade ore averaging 0.17 oz. gold, 0.306 oz. silver and 0.545% copper were concentrated. From this, 424 tons were obtained, averaging 2.542 oz. gold, 2.218 oz. silver, and 2.613% of copper. It will be remembered that the Elmore oil concentration process was tried on this low-grade ore, but it did not answer the purpose, and now the concentration is entirely done by water. The engineers do not attempt to make any estimate of ore reserves, for the high-grade ore occurs too irregularly. Systematic diamond drilling continues to reveal new ore, and there is every reason to expect that the present profits will continue for a few years yet.

General Mining News.

Union Phosphate Co.—The phosphate properties discovered by Mr. Charles C. Jones, of Los Angeles, Cal., in Wyoming and Idaho, have been incorporated under the name of the Union Phosphate Co., in association with the Stauffer Chemical Co., of San Francisco. The Union Phosphate Co. will engage in the mining and shipping of crude rocks, and in the manufacture of superphosphates on the Pacific Coast.

Petroleum Exports.—Exports of mineral oils from the United States for the full year are reported as follows, in gallons:

	1904.	1905.
Crude	95,974,645	102,264,117
Naphthas	22,837,347	26,801,456
Illuminating	745,742,071	858,839,713
Lubricating	87,439,482	110,910,506
Residuum	33,736,412	66,633,457
Total	985,729,957	1,165,440,249

Paraffin is included in lubricating oils. here was an increase in 1905 of 179,710,292 gal., or 18.2% over the previous year.

ARIZONA.

GRAHAM COUNTY.

Clifton, which has so often suffered seriously from floods in the past, is now taking great precautions against them in the future. The Arizona Copper Co. is lining the banks of the river along its works by great masses of slag, forming a solid rip-rap wall so heavy that the current can scarcely make any inroad upon it. On the opposite or town side, a line of piles is driven and a heavy bulkhead of planks to a height greater than any floodline is expected to deflect the water and preserve the bank. A rock-filling behind the plank adds to the strength and permanence of this bulkhead. For a part of the distance, lower down the stream, where the channel is wider, a masonry wall takes the place of piling and planks. Visitors are no longer required to walk the long and swaying suspension bridge, or in case of that becoming useless, to walk a plank across the angry floods but may now get over the San Francisco upon a bridge firm and broad enough to accomodate wagon traffic.

Arizona Copper Co.—This company is working with its usual vigor. Among other improvements the successful introduction of the new Hancock Australian jig is to be noted. This jig has a capacity of some 1,200 tons daily and has displaced the Frue vanners. New Huntington mills of the Anaconda pattern are being set up in addition to new high-speed rolls from the Allis-Chalmers Co. The scrap-heap of this giant copper company is marvellous with its variety and extent, inspiring the visitors who ride up Chase creek, with its magnitude. Old furnaces, blowers, slag-cars, converters, etc., line the track, and form a part of it, being buried up by the gravels and sands deposited by the floods. It is in verity a machine cemetery.

Shannon Copper Co.—This company is running at full capacity. The converter plant is nearing completion. The company now receives about 25 tons a day of high-grade ore from the New England Copper Company.

New England Copper Co.—A tram-way of 20 in. gauge is now under construction from Clifton along the San Francisco river valley to the foot of the hill below this company's mines, by means of which it is expected to increase the shipments to at least 100 tons a day.

Detroit Copper Co.— A recent purchase of a large tract lying between the Coronado and the Metcalf claims of the Arizona Copper Co. is expected to increase the producing capacity largely, in anticipation of which the Detroit is now putting up a concentrating mill of 1,000 tons daily capacity. Between 300 and 400 artizans are now employed upon this work.

Sierra de Oro.—This gold mining company which has been running along a crosscut tunnel in the granite rock of the San Francisco river valley, 4 miles above Clifton, has cut the first of the series of lodes for which the tunnel was projected, and is continuing the work to reach the second of the group, which crops out some hundred feet above the tunnel; and when this second lode is cut a suitable mill is to be placed on the banks of the river. This enterprise is under the immediate direction of Mr. Dell M. Pattes, of Clifton.

Crawford Gold Mining Co.—This company has undertaken the development of a series of gold-bearing lodes in the Gold Hill district, about seven miles north of Metcalf. Some thousand feet of drifts have been run in on the lode. The ore is peculiar for its friability and for slaking in the air to a soft powder. It shows free gold by panning and it is regarded as well adapted to the cyanide process. The chief owners of this property reside in Los Angeles. It is under the direct management of Col. Benjamin M. Crawford, of Clifton.

CALIFORNIA.

CALAVERAS COUNTY.

At Angels the annual shortage of water supply in the fall months has caused great inconvenience to miners, but now that the Utica Mining Co., owning the Union ditch, has increased the capacity of its water reservoirs it is not thought that the mines will have again to close down for lack of water.

Union Copper Co.—The new smelting works of this company at Copperopolis have been started up and are operating successfully. A large force of men is employed at mine and smelter.

EL DORADO COUNTY.

The water supply has held out longer than in most foothill counties of the State this year, but the supply in the El Dorado canal is exhausted, and the mines and mills have had to shut down. The snow fell on dry ground in the mountains this year, and was followed by freezing weather.

INYO COUNTY.

Mount Whitney Mining Co.—At this property, Lone Pine, Superintendent Oney has about 2½ ft. of good ore at the end of the main tunnel. More miners are to be set at work.

Keynote Mining Co.—This company, at Lone Pine, is running its mill on good ore, and has ordered machinery for both Beveridge and Cactus Flat.

Molybdenum.—T. W. Webb has located eight claims of molybdenum ore in the west arm of Death Valley, south of Lida, and is making test shipments.

NEVADA COUNTY.

Banner,—The work of pumping out the north shaft of this mine commenced last September, has been completed. Sinking will now continue to 1,200 ft. and drifts will be run at each 200 ft. to exploit new ground. The old works are in good condition, considering the years they have been flooded.

Noble Place.—An old quartz mine on the Noble place, Nevada City, has been bonded by N. B. Sherrard and M. C. Emerson, who will clean out and repair the incline shaft and develop the property.

Morning Star.—The company operating this property at Badger Hill has arranged to pay outstanding claims, and is expected shortly to reopen it, with H. R. Hicks as superintendent.

Sierra Nevada Mines Development & Explortation Co.—Arrangements are being made by R. Matthews, of San Francisco, to begin work in the tunnel of this company's group of 20 quartz claims in Gaston district. Tonopah capitalists have become interested, and the water rights of the company may be utilized to furnish electric power to Nevada City.

PLUMAS COUNTY.

Glazier.—At this drift mine near Seneca a bedrock tunnel is being run to tap the old channel near the lower end of the holdings of the company. At the upper end the channel paid well.

SAN BERNARDINO COUNTY.

Surprise Mining Co.—This company, at Bear Valley, is building a road to the mine and also erecting new buildings, in order to commence active development work on the property.

SHASTA COUNTY.

Sugar Loaf Group.—This group of 16 copper claims on Spring Creek, owned by Fillius, Grotefend & Galvin, is to be incorporated under Colorado laws and extensive development work commenced.

Mammoth Copper Mining Co.—The water-jackets for the last of the three furnaces at Kennett have been shipped to the mine. A foundation is being laid for the new compressor, which will shortly arrive. A drainage-box is being put in for the full length of the main tunnel.

Uncle Sam.—At this mine, Kennett, un-

der bond to James Neil, 50 men are now employed and the 20-stamp mill is kept busy day and night. Very little has been done at the mine in the past two years. It formerly belonged to the Sierra Buttes Mining Co., Ltd., which worked it for eight years and then sold it.

COLORADO.

BOULDER COUNTY.

Boston.—The 50-stamp and concentration mill on Left Hand creek has been purchased by W. M. Bloomer, of Denver, who intends to put in a roaster and cyanide process, and will treat his own and custom ores, which can be easily delivered by the Colorado & Northwestern Railroad.

Golden Slipper Mining and Milling Co.—After a period of several years spent in litigation this company has secured the Puzzler group near Ward, and arrangements are being made for an early resumption of active operations, as well as the overhauling of the old stamp-mill and the installation of a 50-ton plant of modern make.

CLEAR CREEK COUNTY.

Two Brothers Tunnel.—Providence, R. I., capitalists who are interested in the Specie Payment ownership, have been driving this tunnel in from Virginia cañon and at a distance of nearly half a mile they have cut the Specie Payment vein, at a depth of 1,400 ft. and at a point 700 ft. east of the main shaft. There is over 12 in. of chalcopyrite. Future shipments from this property, as soon as the shaft is reached, will be to Idaho Springs instead of Black Hawk, as in the past. T. J. Johnston, Idaho Springs, is manager.

Little Flat.—Manager J. B. Allen of Idaho Springs has ordered an air compressor plant for early installation on this group on Cascade mountain.

Refugee.—Boston capitalists have purchased this property in Hukill gulch, the reported price being $40,000, the owner being J. J. Elliott of Denver. The property is producing smelting ores as well as milling ores, and it is further reported that the new owners will erect a mill at the portal of the Lost tunnel on Clear Creek. The property is in the Idaho Springs section.

GILPIN COUNTY.

Gettysburg Mining and Milling Co.—It is reported that Walton, N. Y., capitalists will resume operations on the Gettysburg group in Lump gulch and that they will lease the Victoria mill and install a dry process plant for the treatment of the ores. A. M. Willard, Gilpin, Colo., is manager.

Old Town Consolidated Mining Co.—The production for 1905 was $318,214, as compared with $239,946 for 1904, an increase of $78,268, or more than 30%. The dividends paid were $60,000 for first eight months, work being interfered with during the last four months by damage to the transformer. G. K. Kimball, Jr., Idaho Springs, Colo., is manager.

Susan Mary.—Chicago people purchased this property, situated in Gregory district, for a consideration of $6,000, and it is being worked under lease and bond by local people.

SAN MIGUEL COUNTY.

Gold King Basin Mining & Milling Co.—Chas. De Witt and C. B. Herrington, of Telluride, who have a contract for driving the main tunnel on this company's property, in Gold King basin, 400 ft. further, recently encountered a "horse" in the breast of a bore which threw the vein out of place and it was lost. After driving 10 ft. straight ahead the vein was again found in place, larger and stronger and carrying higher values than before. Eighteen inches of gouge matter lines the hanging wall, while the foot-wall carries 16 in. of quartz. Either streak runs good milling values in gold. A cross-lead showing excellent values on the surface will be intersected when the tunnel has been projected 150 ft. more. The company contemplates building a mill and tramway after enough mineral has been blocked out to justify the improvements Willis Connable and C. Lee Peck, both of Coudersport, Pa., are, respectively, president and secretary of the company.

KENTUCKY

CHRISTIAN COUNTY.

Empire Coal Co.—This company, with headquarters at Empire, recently incorporated with a capital stock of $100,000, has puchased all properties, rights, franchises, notes and interests of the Empire Coal & Mining Co., executing a mortgage on the holdings to the Fidelity Trust Co. of Louisville to secure a bond issue of $50,000. Officers of the Empire Coal Co. are Messrs. John D. Anderson, Nashville, Tenn., president; W. H. Anderson, Nashville, secretary; W. T. Rutland, Empire, Ky., manager.

LOUISIANA.

CALCASIEU PARISH.

Jennings.—The Texas Co. intends purchasing land in this district and will develop it extensively.

The Crowley Oil and Mineral Co. has just paid its eighth dividend inside of 18 months, making a total of $160,000 on a capitalization of $200,000.

NEW YORK.

LIVINGSTON COUNTY.

The engineers working on the new salt shaft at Cuylerville state that it will not be long before the mine is in operation, a depth of over 600 ft. already having been reached. Rapid progress is also being made on the buildings, the size of the structures making it apparent that the Sterling Salt Co., which owns the mine, intends to do business on a large scale. The new plant makes another addition to the salt mining companies in the Genesee Valley, the industry having in the last quarter of a century grown to immense proportions. Within but a short distance of the shaft of the Sterling Salt Co. is another mine, the Retsof Co.'s the output of which is large.

NEVADA.

STOREY COUNTY—COMSTOCK LODE.

The Butters tailings plant has been running continuously so far this winter and has made a big hole in the ore tailings pile at the base of Sugarloaf mountain. The company owns large reserves of Comstock tailings at the Chollar mill site and in Sixmile cañon west of the Empire State mill. About 30 men are now employed at the plant.

Fischer's mill is running on ore from the Chollar surface workings hauled there through the summer months, nearly 1,000 tons being piled up at the mill.

Ophir Mining Co.—The most valuable single bar of bullion ever produced from Comstock ore was shipped by express to the Ophir Co., San Francisco, on Jan. 18. It contained $11,964.97 in gold and silver. It was turned out at the Kinkead mill and represents the free gold caught on the silver-plated copper plates from a run of 1,000 tons of Ophir ore. Besides the bullion about 50 tons of concentrates were produced, worth in the neighborhood of $25,000. In the flush days of the Comstock, when it was producing between five and six million dollars per month, the bars of bullion averaged only about $4,000 each in gold and silver, theetaoinetao recovering the values at the time being through amalgamation.

Andes Silver Mining Co.—The stockholders have voted unanimously to increase the capital stock from its present amount of $300,000 in 100,000 shares of the par value of $3 each, to $2,500,000 in 100,000 shares of $25 par value per share.

LINCOLN COUNTY.

A good deal of prospecting work is going on around the old camp of Pioche, and there is a general revival of interest.

WHITE PINE COUNTY.

The new hoisting plant on the Morris mine, the property of the Giroux Consolidated Mines, Ely, passed the trial runs successfully and is now in full operation. Two shifts are at work in the mine extending the drifts and cross-cutting the orebody on the 200 ft. level. No walls have, as yet, been reached in the crosscuts, and the same character of ore is exposed in the face of the drifts that was found in the bottom of the shaft. The Giroux Co. now has a large tonnage of ore blocked out in the several mines upon which it has been prosecuting extensive development work. A new and larger hoist is being installed on the Brooks mine

and as soon as it is ready for commission two shifts will be put on, driving ahead the cross-cuts on the 200-ft. level. Sinking will be resumed on both the Morris and Brooks mines as soon as the prospecting work on the 200-ft. level is finished.

OREGON.

BAKER COUNTY.

Baker City Smelter.—Manager Fred D. Fuller, of the Sumpter smelter, who is in New York, is expected back here very soon. It is understood on good authority, that arrangements will be completed for the building of a 400-ton smelter in Baker City, which will carry with it contracts of copper ore from the Iron Dike mine, at Homestead on Snake river, 60 miles east of Baker City. Recently Mr. Fuller closed a contract with the Ladd Metals Co., at Landore, Idaho, for 3,000 tons of ore, which is now in course of shipment to the Sumpter smelter.

Imperial.—K. O. McEwen, superintendent of this mine, in the Cable Cove camp, about 30 miles west of Baker City, and 15 miles above Sumpter, who is managing the property in the absence of Sibley, of Detroit, Mich., who is in Chicago buying a stamp mill and accessories, reports that they are steadily shipping high-grade ore to the Sumpter smelter.

James P. Sipe Mining Co.—The Buckeye mine, situated in the Bourne camp, at an elevation of 7,400 ft. above the sea, is just now the center of much attention. Recently, the men were at work in the main tunnel, which was not expected to reach the principal orebody for another 400 ft., fired a blast of dynamite, which broke into a vein several feet wide, and heavily mineralized. It is of the same character and appearance as that of the North Pole mine.

United Elkhorn.—This mine is under the management of Edward Field, who came here from Telluride, Colo. It is owned by F. P. Hayes, of Philadelphia, who has arrived from the East for an inspection of the property. A few days ago Manager Field completed the removal of the air-compressor plant, which had been located near the mouth of the big tunnel on the 2,000 level and was operated by water power, to the mine, 1,500 ft. higher up the mountain, where it is now operated by an 85-h. p. electric motor. Drifting is now in progress on No. 4 level, and 4 ft. of ore has been opened in a granite formation. Sixty-five men are at work in the mine and on top and five 6-horse teams are engaged in hauling 10 tons of concentrate daily from the mine to Baker City for shipment to the smelter.

PENNSYLVANIA.

BITUMINOUS COAL.

Monongahela River Consolidated Coal & Coke Co.—The report of this company for the year ending Oct. 31, 1905, showed that the coal mined was 4,962,750 tons, an increase of 804,206 tons over 1904. In addition, the Ohio Valley Coal & Mining Co. produced 95,712 tons and the Corona Coal & Iron Co. 443,324 tons, making a total of 5,501,786 tons controlled by the company. This total shows an increase of 835,508 tons, or 18%, over the previous year. The coal acreage has been maintained by purchases from the depreciation fund. The net earnings were $1,869,152, an increase of $141,385. Charges were: Maintenance and depreciation of river craft, $695,555; depreciation fund on coal mined, $334,654; interest on bonds. $644,466; total, $1,674,675, leaving a balance of $194,477. From this dividends amounting to $194,000 (1.94%) were paid on the preferred stock, leaving $477 surplus. River conditions in the first five months of the fiscal year were unfavorable, owing to almost continued severe weather and ice. The spring and summer months were favorable with respect to frequent rises in the river, but the shipments were comparatively light, because of limited demand for coal during the summer months and the quarantines in the South, the increase in Southern shipments being only 241,000 tons, or less than 16%. The shortage of coal cars seriously curtailed production and increased costs. The company purchased 600 cars during the past year and but for the use of these cars would not have been able to fill contracts.

According to the Connellsville *Courier* the production of coke from the Connellsville and the Lower Connellsville fields in 1905 was 17,896,526 short tons; an increase of 5,469,058 tons, or 30.6% over 1904. The output was the largest ever reported. The average price realized at the ovens was $2.26 per ton, which was $0.51 more than in 1904, but $0.74 less than in 1903. At the close of 1905 there were 23,313 coke-ovens in the district, a net increase of 602 during the year. Only 1,127 ovens were idle, 95.2% of the productive capacity being in use. The total shipments for the year were 688,328 cars. The daily average shipments were 1,886 cars. There were several months during the year when they averaged over 2,000 cars a day. In 1904 the daily average was only 1,623 cars. In 1903 it was 1,782 cars; in 1902, 1,986 cars, and 1901, 1,856 cars. It must be taken in consideration, however, that the size of cars in which coke is transported from the ovens to blast-furnaces has greatly increased. A few years ago cars averaged but 18 tons to the car. There are steel coke cars hauling coke out of the Connellsville district now that carry 50 tons. The small wooden car still keeps the average down, but it can be safely put at well over the 20-ton mark.

SOUTH DAKOTA.

LAWRENCE COUNTY.

Dakota.—A body of milling ore of a grade that can be worked with profit has just been struck in the south drift. So far it has not been well prospected, but indications are that it is a very large body.

Queen of the Hills.—This company expects to begin operations again by Feb. 15, and will continue sinking the shaft, which is now 138 ft. deep. This property in both its shaft and in its tunnel which is in a distance of 345 ft., shows good ore. Some of it is a slate and quartz similar to the ore found on the 600-ft. level at the Homestake. Another orebody encountered in the uprise of the tunnel is a quartz very like that found in the Wasp No. 2.

Clover Leaf.—A report of this property has just been issued preparatory to the placing on the market of bonds to be used for paying off the floating indebtedness, unwatering the mine and doing further development work. This company owns 57 claims in the Roubaix district, among which is the old Uncle Sam. The mine is well developed, has a mill of 60 stamps, and other necessary buildings and apparatus. The great problem has been the water, which has never been handled satisfactorily. Last June, owing to an accident, the mine was flooded, since which time it has remained idle.

Esmeralda.—Ed. Major and associates, of Central City, have leased the old Esmeralda mine, from which much bullion was produced in early days. They have also taken a lease on the Columbus mill at the mouth of Blacktail gulch.

Consolidated Light & Power Co.—This company is just completing at Pluma the largest steam electric plant west of Chicago. Aside from furnishing light it will be the first company in the Black Hills to furnish electric power for the mines. It is building a pole line 30 miles long which will be completed by June. This will put most of the mining companies in the Northern Hills in connection with the plant. The Lundburg-Dorr mill at Terry and the Gilt-Edge Maid, both of them good producers, are now being operated by electric power. A line is also being built to the Ben Hur, one of the Horseshoe properties. The company will be in position to furnish power for mills, hoists and pumps.

TENNESSEE.

CAMPBELL COUNTY.

Jackson Coal Co.—This company's property, situated near the Louisville & Nashville road, has been purchased by R. O. Campbell of Atlanta Ga., for about $50,000. Mr. Campbell, it is stated, will increase his holdings in this section by the purchase of adjacent lands.

WHITE COUNTY.

Caney Fork Gulf Coal Co.—Messrs. R. E. Robinson, F. T. Fancher and D. M. Meredith, of Sparta, Tenn.; Capt. William Hardie, of Bon Air, and Dr. W. B. Young, of Clifty, have incorporated this company with a capital stock of $300,000, for the purpose of conducting development work

on 7,000 acres of coal lands in Bon Air field, which the company has secured. The property is said to afford lateral openings on three sides, showing the Bon Air block coal and Sewanee veins, the latter being reported as about 6 ft. thick. Openings have been made on the east side of the property a short distance from the Nashville, Chattanooga & St. Louis Railway.

TEXAS.

HARDIN COUNTY.

Saratoga.—The Producers' Oil Co., has a new 500 bbl. flowing well and is drilling another east of the Rio Bravo property.

JEFFERSON COUNTY.

Beaumont.—The large well-owners and pipe-line companies recently brought on a strike among their employees by reducing field wages from $3 to $2.50 per day. The men who have an organization entitled the Brotherhood of Oil and Gas workers declined to work for the reduced wages, and tied up nearly all the plants in the various fields. After some days of idleness, but without any unlawful act, the leading employers restored the old rate of wages but refused to recognize the Union. Work has been resumed to a large extent, but the operators say that they will protect their interests and reduce the number of employees by discontinuing the operation of small wells which do not yield sufficient oil to pay for cost of production on the basis of wages established in boom days, when the cost of living was very different from what it is today.

The last month of the year shows no special amount of development in any of the fields and a steadily declining output. Dayton has not made good and operators are not enthusiastic over its prospects, especially as most of the wells are yielding a large percentage of salt water.

The Humble field, which proved so large and so disastrous to prices, is steadily declining in yield. The Sour Lake, Saratoga and Batson fields are slowly but steadily declining, but their aggregate output in 1906 will still be large, especially with advancing crude prices. Among the promising fields which may prove good in 1906 is that of Hoskins Mound, which is practically controlled by the Mound Oil Co., of Houston, and should it prove gusher territory there will be no general rush on over-drilling, for the land is closely held.

The last available figures on stocks are: Texas, 14,000,000; Louisiana, 8,000,000 bbl. Present daily output and crude prices of the various fields are as follows: Spindletop 3,700 bbl.; 45c. Sour Lake, 6,200 bbl; 44c. Saratoga, 5,900 bbl.; 36c. Humble, 21,000 bbl.; 38c. Batson, 9,000 bbl.; 35c. Jennings, 21,500 bbl.; 30c. Dayton produces daily 400 bbl.; Welch 50; Matagorda, 25; Anse La Butte, 450; Total daily southern Texas and Louisiana output, 68,225 bbl. oil.

VIRGINIA.

SHENANDOAH COUNTY.

A tract of 1,180 acres of land on Capon ridge, containing deposits of manganese ore, has been sold to Mishler Brothers, of Hagerstown, Md. The new owners propose to develop the property.

WASHINGTON.

CHELAN COUNTY.

Wenatchee Coal Mining & Development Co.—This company, of Wenatchee, on the Columbia river, has arranged to sink a well 2,000 ft. on its leases two miles southwest of town. The corporation has sunk a 90-ft. shaft, and has found an 8-in. and a 12-in. vein of coal. The oil well will be sunk by a Tacoma man on a share basis.

WHATCOM COUNTY.

The first electric power plant in this mining region has just been completed in the Slate Creek district by the Chancellor Gold Mining Co. at a cost of $40,000. The plant will generate 300 h. p., which will be utilized next year by the Chancellor, Mammoth, Ninety-nine, Mill Creek and Bonito mines for the operation of stamps and drills. Five months were consumed in hauling the machinery over rough mountain roads, installing it and building the power-house. Enough energy is available in Slate and Cañon creeks, the sources of power, to generate 2,000 h. p., according to James Cady, superintendent of the Chancellor.

The electric power plant which the Columbia Improvement Co., a Stone & Webster holding, will build in the Mount Baker district will be in operation in six months. Including the purchase of the bulk of the machinery from the Bellingham Bay Improvement Co., which started the work, the constructing company will spend $480,000 to secure this power. Eventually Stone & Webster will harness all the 10,000 h. p. available at Nooksack Falls, where the generator is being installed. Before the close of January about 300 men will be engaged in construction work and clearing approximately 35 miles of right of way for the transmission line. The entire distance to be traversed from Nooksack Falls to Bellingham, where the bulk of the power will be used, is 42 miles, but seven miles of this is being cleared by the Bellingham Bay & British Columbia railway, which will probably lay rails to the falls next year. Several of the mines will buy electrical power and the First Chance has already negotiated for power.

WEST VIRGINIA.

KANAWHA COUNTY.

Paint Creek Collieries Co.—It is stated from Charleston that all but two of the coal operations on Paint Creek have been purchased by a syndicate. The operating company has incorporated under the name of the Paint Creek Collieries Co., with a capital stock of $5,000,000. W. D. Boyer, of Scranton, Pa., is president; E. P. Mucklow, of Charleston, treasurer, and M. T. Roach, of Charleston, secretary. The plants taken over are the Hickory Camp Coal & Coke Co., Greenbrier Coal Co., Grose Colliery Co., Nuckols Coal & Coke Co., Horton Coal Co., Detroit & Kanawha Coal Co., Standard Splint & Gas Coal Co., Banner Coal Co., Paint Creek Coal Co. and the Scranton Splint Coal Co. The Imperial Colliery Co. and the Wacomah Coal Co. are the only independent companies left in the district.

Detroit & Kanawha Coal Co.—On Jan. 18 an explosion occurred in one of this company's mines in the Paint Creek district. Details have not been received, but it appears to have been a dust explosion. There were 18 men killed, all who were in the mine at the time. A number left just before the explosion, and thus escaped.

WYOMING.

The State Geologist reports that under the law passed last year, 24 mining companies have filed voluntary sworn statements of their properties and condition. A certified copy of any of these statements can be obtained from the State Geologist's office at Cheyenne on payment of a fee of $1. The companies reporting are as follows:

Albany County: Strong Copper Mining Co., Medicine Bow Mines Co., Maggie Murphy Copper Co., Jupiter Mining Co., Three Cripples Mining Co., Esterbrook Mining Co.; six in all.

Carbon County: Rip Van Winkle Consolidated Gold Mining & Milling Co., Investor's Mining & Prospecting Co., Northwestern Copper Mining Co., Boston-Sierra Madre Mine Industry Co., Echo Copper Mining & Milling Co., Winona-Rex Copper Mining Co., Aetna Mining Co., Verde Mining & Milling Co., Anchoria Copper Mining Co., Oshkosh-Wyoming Mining Co., Pluto Gold & Copper Mining Co., Independence Mining Co., Azurite Mining Co., Jack Pot Mining & Milling Co., Shawnee Copper Mining Co., Penn-Wyoming Copper Co.; 16 in all.

Laramie County: Globe Copper Mining Co., Emerald Mining Co.; two in all.

Foreign Mining News.

CANADA.

BRITISH COLUMBIA.

Tyee Copper Co., Ltd.—This company informs us that its smelter at Duncan Station, Vancouver Island, ran 17 days in December, and treated 2,035 tons of Tyee ore, giving a return, after deducting freight and treatment charges, of $33,460. This shows an average of $16.44 per ton.

ONTARIO.

J. J. Hohmann, of Pittsburg, Pa., representing the Michipicoten Gold Mining Co. owned by American capitalists, has leased 10 claims in the Michipicoten district and is negotiating for others, in order that the

area may be thoroughly tested for gold. The company have made arrangements for power which is being developed at Michipicoten Falls and is to be ready for delivery by June 1, by which time the company will be in position to commence development operations. Ten men are at work at the Falls. The company will erect a 50-stamp mill.

QUEBEC.

Some important mineral discoveries have recently been made in the Lake St John district of Northern Quebec, about 100 miles north of Roberval. Discoveries of gold, copper and asbestos were some time since reported by Mr. Obalski, the Provincial Mining inspector; and more recently John C. Hardman, after investigating the field for the United States Steel Corporation, which has acquired property there, stated that there were four or five seams of best quality asbestos which, with adequate transportation, could be profitably developed. Interest in this field has been increased by late reports from engineers who have just returned to Quebec, and state that gold veins have been discovered assaying from $4 to $30 to the ton, one vein being over 1,000 ft. in length. Copper was discovered and also deposits of nickel.

MEXICO

DURANGO.

Akers & Hughes Propetry.—Mr. Frank H. Hughes reports the purchase of a number of stamps of Richards' rapid-economy type for installation on their property. Grading for the mill site is now in progress. The batteries are expected to be shipped from San Francisco about the end of this month and will be crushing ore by March .

SONORA.

Gaudalupe.—This hine, in the Bacoachi district, not far from the Picacho mine belonging to the Phelps-Dodge Co., is showing signs of greatly increased activity. There are now more than 1,000 ft. of tunnels, shafts, drifts and crosscuts opened. The lower tunnel is in about 350 ft., while the upper tunnel has been driven to crosscut the vein whence a drift connects it with shaft No. 1 at the 200-ft. level. Crosscuts in the tunnels and shafts, with exploratory holes at several points and a surface crosscut on the outcrop complete the present workings. The upper workings are in blue and yellow quartz, and samples taken from across the entire vein give values of $14 gold, and from 12 to 22 oz. silver per ton.

AFRICA

TRANSVAAL.

The later advices from Johannesburg put the production of the Transvaal in December at 431,594 oz. fine gold. This makes the total output for the year 4,897,221 oz. fine gold, or $101,225,558; showing an increase of 1,117,000 oz. or 29.6%, over the previous year.

ASIA.

INDIA-MYSORE.

*Kolar Goldfield.*y—The production in December was 54,201 oz. bullion, the largest monthly output on record. For the year 1905 the total was 627,700 oz. bullion, an increase of 4,012 oz., or 0.6%, over 1904. The bullion reported last year was equal to 564,930 oz. fine gold, or $11,677,103 in value.

Coal Trade Review.

NEW YORK, Jan. 24.

ANTHRACITE.

There is little to report in the anthracite trade. The continuance of extremely warm weather has produced something like stagnation among the retailers; a condition which is inevitably reflected in the wholesale trade. There are, of course, small shipments, but they do not affect the aggregate to any considerable degree. Dealers are hopeful that the present weather conditions will not continue much longer; but even continued cold weather from now until spring would not make up for the months already lost.

Prices on domestic and small sizes remain firm at the following quotations: $4.75 for broken and $5 for domestic sizes. Steam sizes: $3 for pea; $2.25@$2.50 for buckwheat; $1.45@$1.50 for rice and $1.30@$1.35 for barley f. o. b. New York harbor shipping points.

BITUMINOUS.

The seaboard bituminous market shows no material change. The continued mild weather, as has been heretofore explained, makes less difference in bituminous sales than in anthracite. The trade to the far East is falling off, as manufacturers are largely stocked for the balance of the winter. There is still some complaint about delays in unloading. Long Island Sound ports continue to take a lot of coal.

All-rail trade is steady, and here the mild weather is favorable, as there are no delays in transportation. Car supply remains reasonably good.

In the New York harbor trade demand remains good. Generally the trade is in excellent condition, and prices show no change that can be noted.

Coastwise trade shows no change in supply of vessels or in rates asked. The weather has been favorable for this trade.

COAL TRAFFIC NOTES.

The total coal and coke traffic originating on all lines of the Pennsylvania Railroad east of Pittsburg and Erie for the year to Jan. 13, was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	139,669	170,088	I. 30,419
Bituminous	976,628	1,276,748	I. 300,120
Coke	406,393	471,975	I. 65,582
Total	1,522,690	1,918,811	I. 396,121

The new year already shows a considerable gain over last year.

Shipments of coal and coke over the Baltimore & Ohio Railroad for the 11 months ending Nov. 30 were as follows in short tons:

	1904.	1905.	Changes.
Anthracite	981,229	960,932	D. 20,297
Bituminous	17,565,352	20,346,995	I. 2,781,643
Coke	2,784,148	4,417,105	I. 1,632,957
Total	21,330,729	25,725,032	I. 4,394,303

The increase in coke was very large, being proportionally greater than that in coal.

The Norfolk & Western Railroad reports coal tonnage for the 11 months ending Nov. 30 as below, in short tons:

	Coal.	Coke.	Total.
Tidewater	3,040,967	125,451	3,166,418
Line point3	6,352,801	2,071,671	8,424,472
Total	9,393,768	2,197,122	11,590,890

As compared with 1904, there were increases of 1,148,258 tons in coal; of 732,388 tons in coke; and of 1,880,646 tons, or 19.4%, in the total.

The Ohio Coal Traffic Association reports coal shipments as follows, for the 11 months ending Nov. 30, in short tons:

	1904.	1905.
Hocking Valley	3,572,982	3,396,795
Tol. & Ohio Central	1,828,546	1,431,821
Balt. & Ohio	1,531,069	1,806,267
Wheeling & L. Erie	2,173,982	2,450,863
Cleve., Lorain & Wh	1,567,043	1,904,125
Zanesville & West	900,094	936,380
Tol. Div., Penna. Co.	1,801,561	1,686,902
L. Erie, Alliance & Wh.	348,431	721,845
Total	13,723,708	14,334,798

There was an increase of 611,090 tons, or 4.5% last year in the total:

Lake coal traffic for the season, ending Dec. 1, is reported as follows, in short tons:

	1904.	1905.	Changes.
Shipments	13,236,858	13,879,279	I. 642,421
Receipts	12,117,932	12,034,735	D. 83,197

Shipments in 1905 include 1,740,968 tons for fuel consumption of vessels. The exports to Canadian ports, in 1905 were 1,755,491 tons anthracite and 4,977,036 tons bituminous; a total of 6,732,527 tons.

Coastwise coal shipments from Atlantic ports for the 11 months ending Nov. 30 were as follows:

	Anthracite.	Bituminous.	Total.
New York	13,518,719	8,240,713	21,759,432
Philadelphia	1,890,066	3,702,887	5,592,953
Baltimore	231,617	2,575,872	2,807,489
Newport News	.....	2,523,136	2,523,136
Norfolk	.....	2,231,693	2,231 693
Total	15,640,402	19,274,301	34,914,703

The total increase in 1905 was 3,960,672 tons. The coal supplied to vessels for their use was 3,116,078 tons in 1905.

Birmingham. Jan. 22.

Alabama coal is in strong demand. The home consumption is increasing as well as the outside demand. The railroads are not handling all the coal as promptly as might be desired, but are doing as well as they possibly can. A shortage of locomotive power is reported on some of the lines. The car shortage is not very pronounced except on one road.

The Sloss-Sheffield Steel & Iron Co. will shortly begin shipping coal from its Bessie mines, in the western part of Jeffer-

son county. These mines have been opened on a big scale, the equipment being first-class. The Tennessee Coal, Iron & Railroad Co. has placed a full electrical haulage system in its mines at Warner..

Cleveland. Jan. 23.

The open weather of the past few weeks has brought about a radical reduction in all fuel prices. The coke market has softened materially, due to the better shipments, and now the best grades of 72-hour foundry coke are selling at $3.25 at the ovens with some off cokes selling lower than that. The best grades of foundry coke are selling at $2.50 to $2.60 at the ovens, being easy at that figure.

There is no let-up in the consumption of steam coal, but the open weather has permitted such heavy shipments that the market here has been glutted and prices have run off again, while further measures have been resorted to to curtail the supply. Run-of-mine is selling to 90@95 at the mines. The sacrificing of coal held in cars, to avoid car service charges, has had a good deal to do with the situation. There is a good demand for slack, the supply. Run-of-mine is selling at 90@95 the closing down of some of the mines. The price is $1 at the mines in the middle district and 90c. in the Pittsburg district.

A meeting will be held shortly by the lake interests to fix the prices of coal to the northwestern trade. A good many of the shippers are already chartering boats for the movement of lake three-quarter for the ensuing year.

Pittsburg. Jan. 23.

Coal.—The unprecedented mild weather and excellent shipping facilities caused a big slump in prices. Contracts were made during the week at prices ranging from 90c. to $1 a ton for mine-run coal at the mine. There is a good demand and most of the mines in the Pittsburg district are in full operation. Operators do not seem to anticipate a disagreement on the new mining scale, and are making contracts for future delivery but, of course, all have the customary strike clause. Two large contracts were booked within the past four days. One by the Pittsburg Coal Co. with the Pittsburg Steel Co., which calls for the delivery of 1,000 tons a day for a period of six years. The other was by the Monongahela River Consolidated Coal and Coke Co. with the Midland Steel Co., and calls for the shipment by river of 250,000 tons annually for five years. The shipments are to begin on April 1, when it is expected the new plant of the Midland Co. being built at a point near Beaver on the Ohio river, 26 miles below Pittsburg, will be completed. Pittsburg operators will leave tonight for Indianapolis to attend the joint conference with the miners on the new mining rate, the meeting being scheduled to open on Thursday. They have been informed that the miners will make a demand for a general advance of 12½% for all miners and mine laborers, and that a 7-cent differential be established between pick and machine mining. Operators say the miners are persuing their usual tactics and seem confident that the present rate and conditions will be continued.

Connellsville Coke.—Prices have declined, and furnace coke for prompt shipment is quoted at $2.50@$2.65 a ton, and sales of foundry coke have been made at $3.25 a ton. The mild weather is responsible for these low prices and a stiff advance is expected if a cold wave strikes the region. The production and shipments in the Connellsville field show some gains over the previous week. The production is given at 285,490 tons, and the shipments aggregated 12,414 cars, distributed as follows: To Pittsburg and river points, 4,485 cars; to points west of Pittsburg, 6,632 cars; to points east of Everson, 1,297 cars. The combined output for the Connellsville and Masontown fields for the week amounted to 361,876 tons.

San Francisco. Jan. 18.

Mr. J. W. Harrison's yearly circular for 1905 is as follows:

The consumption of coal for 1905 is 219,182 tons less than 1904. This shrinkage must not be taken as an indication that our fuel requirements have been at all less than in 1904. The apparent diminished quantity of coal fuel has been much more than made good, by an output this year of fully 3,000,000 barrels of fuel oil in excess of last year. The quantity of coal shipped here from British Columbia is in excess of last year shipments, whereas the Australian amount has shrunk fully 40%. A new feature has recently developed itself in Colonial deliveries made here by steamers; there are several already chartered, which have yet to arrive. With freight at about 16s per ton, and with the duty of 67c per ton, the importers receive a very small compensation for the coal; less than one-half the amount demanded for British Columbia coal at port of shipment.

The quotations of coal of all grades have ruled very uniformly throughout the year; the prices of steam grades have favored the buyers, having fuel oil for a close competitor. This has not been an advantageous port for coal carriers to come to, on arrival here they find no profitable outward business, either for lumber or cereals. We are promised a reduction of about 25% in the price of gas at an early date; this will necessarily lead to an increased demand for gas stoves for cooking and heating purposes, and will naturally diminish the coal consumption for the same purposes. The labor disturbances in British Columbia which lasted for about six months this year, served to diminish the importations from the Nanaimo section, and helped to increase the Colonial importations, both as to quantity and price. Favorable terms were reached in November last, and work has been recommenced, and is now running harmoniously. About 80% of the coal trade is under the control and supervision of one firm locally. This is found to work with advantage to the buyers and the sellers, as the material can be handled so much more economically, and prices are sustained more uniformly. There are six steamers now being utilized by this firm, transporting coal from British Columbia only; the last deliveries here of the six steamers amounted to over 24,000 tons, partially for steam purposes, and partially domestic grades.

The various sources from which we have derived our coal supplies are as follows:

	1904	1905
British Columbia	335,137	348,515
Australia	148 409	85,031
English and Welsh	61,664	65,087
Scotch	1,666	None
Eastern(Cumberland&Anthracite)	29,055	11,663
Seattle (Washington)	139,063	84,965
Tacoma (Washington)	182,313	81,480
Mount Diablo, Coos Bay, and Tesla	96,520	114.930
Japan, and Rocky Mts. by rail	54,245	40,219
Total	1,051,072	831,890

To secure a complete statement of the entire coal consumption of California, I have been obliged to include deliveries at Port Los Angeles and San Diego by water, which have been added to the above sources of supply. The total amount received by water at those ports foot up 38,197 tons.

Fuel Oil.—The total oil products for 1905 will aggregate about 33,000,000 barrels, which will be about 10% increase over the output of 1904. The product for 1903 was computed to be 21,000,000 barrels; and for 1902, 13,000,000. The amount of crude oil exported during the year will be in the neighborhood of 800,000 barrels, the amount of oil in tankage is estimated to be about 10,000,0000 barrels, the manufacture of kerosene has consumed about 4,000,000 barrels. A quantity is utilized in sprinkling roads, and the manufacturing of lubricating oils and naphtha; the figures of these have not yet been received for this year. The railroads of the State are computed to be consuming about 15,000,000 barrels annually, proving that fuel oil discovery in California, and the low prices at which it is being procured, has proved a greater boon to railroads than any other line of commerce.,

Coke.—The total deliveries here by sail during the year will aggregate 66,511 tons, as against 57,991 tons last year; over 50% of this year's deliveries was shipped from Great Britain, the remainder came from Belgium and Germany.

Foreign Coal Trade.

Jan. 24.

Exports of fuel from Great Britain, with coal sent aboard for the use of

steamships engaged in foreign trade, were as follows for the full year, in long tons:

	1904.	1905.	Changes.
Coal	46,255,547	47,476,707	I. 1,221,160
Coke	756,949	774,110	I. 17,161
Briquets	1,237,784	1,108,445	D. 129,329
Total exports	48,250,280	49,359,270	I. 1,108,992
Steamer coal	17,190,900	17,396,146	I. 205,246
Total	65,441,180	66 755 418	I. 1,314,238

There was an increase last year of 2% in the coal consumed beyond the limits of the United Kingdom, this total being about 28% of the coal mined. The exports to the United States, included above, were as follows, in long tons:

	1904.	1905.	Changes.
Atlantic ports	33,394	56,609	I. 23,215
Pacific ports	75,700	75,160	D. 540
Total	109,094	131,769	I. 22,675

The total increase was 21.7%, all in shipments to Atlantic ports; but the total was still small.

Iron Trade Review.

NEW YORK, Jan. 24.

The only change that can be reported in the iron and steel markets is a shade of hesitation in some lines; but in others there is a steady rush of work, as for some time past. This is especially the case with plates and structural material. Apparently there is no end to building projects, and the capacity of the structural mills is so fully taken up, that some builders will be disappointed, because they will not be able to get material. The demand for railroad equipment is also great enough to keep the car builders busy throughout the year.

The larger interests have apparently succeeded in preventing too rapid an advance of prices, and there have been few changes. They have not been able, however, to prevent the asking and payment of premiums to secure deliveries. This is quite common, especially with smaller buyers.

A number of small orders for rails have been coming in, making a considerable total. The rail mills now have about 75% of their capacity for the entire year filled, and more work is still coming.

Shippers of ore are already looking after arrangements for the opening of Lake traffic. There is some talk of labor troubles, and these may delay the vessels when the opening of navigation comes.

Birmingham. Jan. 22.

With order books well filled for the first quarter in the year and steady selling for the second quarter, the pig-iron market conditions in Alabama can be reported as being most satisfactory. There is a healthy shipment of iron from this district, every effort being made to move out the product on orders accepted some weeks back. During the week the cast-iron pipe-makers have been buying liberally in this section.

The following iron quotations are given: No. 1 foundry, $15; No. 2 foundry, $14.50; No. 3 foundry, $14; No. 4 foundry, $13.50; gray forge $12.50 to $13; No. 1 soft, $15; No 2 soft, $14.50.

The steel trade is very active, the demand good and quotations firm. No change is reported in machine shop and foundry circles. Good prices obtain for the various products and the prospects are bright.

Much talk is still heard in this district in regard to the merger of the Tennessee Coal, Iron and Railroad Co., and the Republic Iron & Steel Co. taking over Sloss-Sheffield Steel and Iron Co. and the Alabama Consolidated Coal and Iron Co. There is positively no knowledge of selling of stocks in these companies as far as the general offices of the interested concerns go.

Cleveland. Jan. 23.

Iron Ore.—No big sales have been reported either off dock or for shipment during the remainder of the year. A few lots are still on the market for which vessel charters are to be made, but the vessel owners are waiting on lake developments before committing themselves. Many of them desire to take the wild rather than the contract rates. Their position, they believe, will be especially strong, if the labor difficulties now threatened materialize. Contract rates are 75c. from Duluth to Ohio ports; 70c. from Marquette and 60c. from Escanaba.

Pig Iron.—A lull has come in buying of foundry pig iron. The supply for spot shipment has eased slightly and prices have receded. Sales are now made on the basis of $17.50 in the Valleys for No. 2, which is the price on material for long time delivery.

Finished Material.—The demand for sheets is especially strong, mills being sold up so that shipments cannot be made inside of ten weeks, which is throwing the better part of the demand to the jobbing trade. Some mills have put up plate prices, but the advance has not been general. The demand from car and shipbuilders is especially strong. Billets are easier and the forging quality is now selling at $33@$34 Cleveland, while bessemers are selling at $25@$26 Pittsburg. The larger mills are furnishing a better supply of big beams and channels, but the smaller sized angles are in demand and premiums are paid. Bar iron is scarce at 1.75@1.80c. at the mill. Buying is light for the minute but mills do not need business.

New York. Jan. 24.

The market continues firm and an unusual amount of contracting is being done for January.

Pig Iron.—Foundry iron is still in demand, and orders are being placed for second and third quarter delivery in liberal fashion. There is a steady demand for basic iron.

Prices for Northern iron are firmer. For large lots we quote; No. 1X, $19@$19.50; No. 2X, $18.50@$18.75; No. 2 plain, $17.75@$18.25; gray forge, $17@$17.25. Virginia foundry is held at $18.60@$19.10 for No. 1, and $18.10@$18.60 for No. 2. Basic is $18.75 for Alabama, and 25c. less for Northern. For Southern iron, on dock, quotations are: No. 1, foundry, $18.75; No. 2, $18.25; No. 3, $17.50; No. 4, $17; No. 1 soft, $18.75; No. 2 soft, $18.25; gray forge, $16.50.

Business in warrants is very light and prices nominal.

Cast-Iron Pipe.—Prices are higher, the present basis being $29.75 per net ton for 6-in. pipe in carload lots at tidewater points. Business is good.

Bars.—Business is good and prices are firm. Mills are asking 1.895@1.945 for common bars and 1.95@2c. for refined bars in large lots at tidewater. Steel bars are 1.745@1.795c., same delivery. Store trade is good at 2.25@2.50c., delivered.

Plates.—Steel plates are in steady demand. Tank plates are nominally 1.745@1.825c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.745@1.845c., according to width. These are the pool prices. Jobbers continue to ask heavy advances on small lots.

Structural Material.—Orders continue to come forward for bridge and building work. Prices are nominally unchanged. Beams under 15-in. are 1.845c. for large lots; over 15-in. 1.895c.; angles and channels, 1.845c., tidewater delivery. These are the pool prices, but buyers have to pay all sorts of premiums to secure material when they want it.

Steel Rails.—No change in standard sections. Light rails are in steady demand, prices ranging from $26 for 35 lb., up to $33 for 12 lb. rails. More inquiries are noted for trolley rails for next summer delivery.

Old Material.—Demand is steady, and prices are firm, except for steel scrap. No. 1 railroad wrought is $22@23; No. 1 yard wrought, $21@$22; machinery cast, $14@$15; heavy steel melting scrap, $17.50@$18. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. Jan. 24.

Pig Iron.—Large purchases of bessemer and basic iron continue to be made in this territory. The smaller buyers have for some time been pursuing a cautious policy, but the events of the past two or three days point to the probability of an improving demand from this quarter. The intimation is given out today that the larger consumers are now negotiating for a lot of work. The demand for forge iron is more apparent and grows out of the additional business coming to the bar mills of middle and eastern Pennsylvania. Quotations may be approximately given

at $19.50 for No. 1 X foundry; $18.75 for No. 2 X; $18 for No. 2 plain; $19 for best No. 2 Southern; $17.50 for gray forge standard; $18 for basic; $19.50 for bessemer and $19.25 for malleable iron.

Steel Billets.—The requirements of consumers appear to be expanding this week as shown by numerous inquiries. Prices run close to $30, but for special qualities range from $34 to $38.

Bars.—The only people who have been affected by the attempt to advance the price of bar iron are the smaller consumers. It is hardly correct to say that any of the larger buyers are paying more money, though efforts are being made to stick to the advance. Only a moderate amount of new business has been booked within the past week and there is a feeling that bars will be the first to feel any weakening tendency, the possibilities of which are now beginning to be apparent. The stores are selling a good deal of bar iron and are holding the highest prices.

Sheets.—The sheet mills are better able to maintain the advance of $2, particularly as the bulk of their business at present is with retail buyers.

Pipes and Tubes.—Pipe work is crowding capacity in this territory and all the shops using tubes are overcrowded so that the business is maintained at the usual average.

Plates.—The same conditions heretofore mentioned continue with all the plate mills.

Structural Material.—There are inquiries in the market at present for extraordinarily large lots of material. It is probable that there will be some disappointed builders before long. Mill capacity is strained to its utmost and new work is bobbing up all around.

Steel Rails.—There is a rush of inquiry for steel rails, the aggregate of which is estimated this week at over 100,000 tons, but in some instances the requirements are not urgent. All of this business will be conditionally accepted, but dates of delivery will not be determined upon until the manufacturers can arrange matters more clearly.

Old Material.—Greater activity is in sight for old material, as shown by inquiries from several quarters; just at present the scrap people are not doing much business. The holders of scrap are insisting upon what buyers regard as extravagant prices, but they thave the advantage. Heavy melting steel scrap is badly wanted and is quoted at $17; railroad scrap, $22; machinery cast, $15; old iron rails, $23 per ton.

Pittsburg. Jan. 23,

Several bessemer pig-iron deals are pending and likely will be closed this week after which there will be but little available steel-making pig-iron in the Pittsburg and Valley districts for the first half. While no definite information has been given out, it is reported the Lackawanna Steel Co. and the Cambria Steel Co. are figuring on buying large tonnages for second-quarter delivery. The United States Steel Corporation will probably take about 50,000 tons of bessemer iron from the Bessemer Pig Iron Association for the second-quarter at the established price of $17.75, Valley furnaces, and it was said today that the deal had been practically closed, but for some reason official announcement would be withheld for the present. Foundry iron is easier, with a slight drop in prices. The remarkably mild weather has enabled pig-iron producers to make prompt deliveries and to buy coke at a lower price than had been figured on earlier in the winter. It was thought a minimum rate of $3 a ton for furnace coke would be firmly maintained after the opening of the year, but prices have declined and this week $2.50 a ton can be done for prompt shipment.

The iron and steel mills in this district are being operated to capacity, and the railroads are supplying all the cars needed, enabling the mills to catch up on deliveries and be ready for new business. A large tonnage of structural material has been placed this month, but it is chiefly for extended shipment. Rail tonnage also is heavy but the mills can conveniently care for all the business so far offered, as the capacity is at least 3,000,000 tons and contracts booked to date do not exceed 2,200,000 tons. There is an indication that some railroads will enter the market shortly for steel cars, although it is known that deliveries will be impossible before 1907, as the steel-car concerns are filled up for this year. The industrial situation becomes brighter every week, as the success of the movement to prevent a runaway market develops. Leading interests seem to be determined not to disturb prices in lines where a satisfactory point has been reached, but some readjustments in a few lines that have been weak are yet to be made. Merchant pipe prices have been very low for some time and the demand is becoming active. An advance by the leading interest is expected about Feb. 1. The plate mills are well filled up for at least six months, and while an advance would be warranted, it has been decided to make no change, except for shipments to the Pacific Coast. The principal interests that compose what is called the plate pool have just removed the differential of $4 a ton. Heretofore plates for the three Pacific Coast States have sold on a basis of 1.40c., Pittsburg, the regular rate being 1.60c., Pittsburg. The freight to the coast is 75c. and the former delivered price to San Francisco, Los Angeles and Portland and common points was 2.15c. It is now 2.35c.

The recent advance in prices by the American Sheet and Tin Plate Co. did not check buying, and the company is now sold up for the first quarter and has business in sight that will keep its plants running steadily for several months. The week opened with 97% of its 165 sheet mills and 80% of its 242 tin-plate mills in operation. The Star tin-plate plant in this city and 10 of the 20 mills of the South Sharon works were started yesterday besides several idle mills in different sections of the country. Owing to the removal of the limit of output, the production is now greater than at any time in the history of the company, not excepting the brief period last year when 100% of its mills were running. The independent mills also are well filled with orders but are not operating as satisfactorily owing to the scarcity of steel. The leading bar-iron interest continues to quote common iron bars at 2c. Youngstown, or 2.04¾c. Pittsburg, but sales have been made during the week at 1.90c. Pittsburg. Merchant steel bars remain at 1.50c. but new business is comparatively light. Specifications are heavy and on some sizes mills are several months behind in deliveries.

Pig Iron.—Sales of bessemer iron in small lots during the week aggregated about 2,500 tons for delivery in the first quarter at $17.50@$17.75, Valley furnace. Foundry No. 2 is easier and is quoted at $17.25, Valley furnace. Gray forge continues strong and a number of sales have been made at $16.50, Valley, or $17.35, Pittsburg.

Steel.—Bessemer and open-hearth billets continue scarce and are quoted nominally at $26, but 50c. or $1 a ton more could be obtained. Sheet and tin-plate bars are quoted at $27@$27.50. Merchant steel bars remain at 1.50c. and plates at 1.60c.

Sheets.—There is a fairly good demand and new business is being booked at the recently established prices of 2.40c. for black sheets and 3.45c. for galvanized No. 28 gauge.

Ferro-Manganese.—The market is very irregular and 80% ferro may be quoted at $135@$175. On contract for delivery in the second half $85 is quoted.

Dusseldorf, Germany. Jan. 4.

The output of the German blast-furnaces in November did not quite reach the high point of October. The total was 988,000 metric tons of pig iron, or 16,943 tons less than in the previous month. As November has only 30 days, however, the daily average output was 32,933 tons, against 32,482 tons in October, a gain of 451 tons. For the 11 months ending Nov. 30 the total output was, in metric tons:

	1904.		1905.	
	Tons.	Per Ct.	Tons.	Per Ct.
Foundry iron	1,694,387	18.4	1,728 835	17.3
Forge iron	754,295	8.2	744,522	7.5
Steel pig	576,103	6.2	636,826	6 4
Bessemer pig	300,573	3.9	386,804	3.9
Thomas pig	5,847,389	63.3	6,461,552	64.9
Total	9,232,747	100.0	9,958,539	100.0

Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

The increases shown this year were 34,448 tons in foundry iron; 60,723 tons in steel pig; 26,231 tons in bessemer, and 614,163 tons in Martin, or basic, pig. The only decrease was 9,773 tons in forge iron. The total gain was 725,792 tons, or 7.9%. The total for 1905 will be close to 11,000,000 tons.

Heavy Chemicals and Minerals.

NEW YORK, Jan. 24.

Messrs. J. M. Lang & Co. report shipments of Florida phosphate rock through the port of Savannah in December as follows: Bremen, 9,743 tons; Hamburg, 2,680; Genoa, 2,181; total, 14,604 tons.

Messrs. Ladenberg, Thalmann & Co., of New York, report that the imports of iron and copper pyrites into the United States from Europe and Newfoundland in 1905 were 566,000 tons; an increase of 74,000 tons, or 15% over 1904. The imports in detail were: Rio Tinto, 184,600 tons; Mason & Barry, 91,900; Peña de Hierro, 90,700; Perrunal, 56,100; Pilley's Island, etc., 53,800; Tharsis, 43,100; Tilt Cove, 32,300; York Harbor, 3,600; Stratoni, 3,300; Coronada, 2,800; Carpio, 2,400; Buitron Co., 1,000; sundries, 400 tons. The receipts were divided as follows: Atlantic ports, 480,200 tons; Gulf ports, 77,000; Pacific ports, 3,100; Washburn, Wis. (Lake Superior), 5,700 tons.

Prices of heavy chemicals show no material change, and are given in the following table:

PRICES.

Acids.		
Boric, crystals	per lb.	.10
powdered	"	.10½
Carbonic, liquid gas	"	.12½
Hydrofluoric, 30%	"	.08
48%	"	.05
60%	"	.11
Nitric acid, 36°, 100 lb	"	$4.75
38°, 100 lb	"	5.25
40°, 100 lb	"	5.50
42°, 100 lb	"	5.75
Oxalic acid, com'l, 100 lb		$5.00@5.25
Sulphuric acid, 50°, bulk, ton		13.50@14.50
60°, 100 lb. in carboys		1.00
60°, bulk, ton		18.00@20.00
66°, 100 lb. in carboys		1.25
66°, bulk, ton		21.00@23.02
Blue Stone (Copper Sulphate), carload lots, per 100 lb		$5.90
Nitrate of Soda, 100 lb 96%		2.20
Sulphate of Ammonia, per 100 lb		3.10@ 3.15
Sulphur.		
Louisiana, New York, Boston or Portland ton		$22.12½
Philadelphia or Baltimore "		22.62½
Pyrite.		
Domestic, furnace size Unit		11c.
Fines "		10c.
Imported, lump, At. ports "		10@11c.
" fines " "		9½@10c.
" furnace size "		11½@12c.

Pyrite prices are per unit of sulphur. On lump deliveries, a charge of 25c. per ton is made for breaking to furnace size.

Phosphates.	F. o. b.	C. I. F. Gt. Britain. or Europe
*Fla., hard rock	$7.75@8.00	$10.90@12.10
land pebble	4.00@4.25	7.95@ 8.65
†Tenn., 78@80%	4.60@4.65	.....
78%	4.00@4.25	.....
75%	3.65@3.75	.....
68@72%	3.25@3.50	.....
‡So. Car. land rock	4.00@4.25	.....
river rock	3.75@4.00	.....

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.50	$0.51½
Peruvian soles and Chilean	0.45	0.47
Victoria sovereigns	4.85½	4.87½
Twenty francs	3.86	3.88
Spanish 25 pesetas	4.78	4.80

Metal Market.

New York, Jan. 24.

Gold and Silver Exports and Imports.

At all United States Ports in Dec. and Year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1905	$2,668,532	$3,982,040	Imp. $1,313,508
" 1904	13,502,827	3,336 184	Exp. 10,166,643
Year 1905	46,794,467	50,246,564	Imp. 3,452,097
" 1904	121,211,827	84,803,234	Exp. 36,408,593
Silver:			
Dec. 1905	8,196.149	4,646,789	Exp. 3,549,360
" 1904	4,114,661	2,252,955	" 1,861,706
Year 1905	57,513,102	35,892,196	" 21,620,906
" 1904	50,135,245	26,087,042	" 24,048,203

These statements cover the total movement of gold and silver to and from the United States. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending January 20, and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ 2 000	$ 58,358	$1,507,039	$123,572
1906	536,000	118,926	6,385,082	185,382
1905	8,016,432	111,885	2,294,318	61,746
1904	209,784	1,113,383	3,222,787	53,700

Imports for the week, both gold and silver, were from the West Indies and South America. Exports of silver were chiefly to London.

Some gold continues to go to Mexico for the purchase of silver; $850,000 having been taken in New York this week for that purpose.

The statement of the New York banks—including all the banks represented in the clearing house—for the week ending Jan. 20, gives the following totals, comparison being made with the corresponding week of 1904.

	1905.	1906.
Loans and discounts	$1,098,811,500	$1,025,595,500
Deposits	1,163,815,200	1,029,369,300
Circulation	42,950,700	52,683,400
Specie	224,029,800	189,968,300
Legal tenders	90,657,800	84,138,600
Total Reserve	$314,687,600	$274,106,900
Legal requirements	290,953 800	257,342,350
Surplus	$23,733,800	$ 16,764,550

Changes for the week this year were increases of $20,553,900 in loans, $11,638,800 in specie, $357,000 in legal tenders, $32,163,100 in deposits and $3,955,925 in surplus reserve; a decrease of $307,400 in circulation.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars.

	Gold.	Silver.	Total.
New York	.....	.....	$189,968,300
England	$154,577,575	.....	154,577,575
France	572,611,930	$212,469,135	785,081,065
Germany	173,585,000	57,860,000	231,445,000
Spain	75,190,000	114,745,000	189,935,000
Netherlands	33,026,000	30,144,500	63,170,500
Belgium	15,773,335	7,886,665	23,660,000
Italy	139,290,000	17,662,500	156.952,500
Russia	518,050,000	18,145,000	536,195,000
Austria	226,045,000	61,470,000	287,515,000

The returns of the Associated Banks of New York are of date Jan. 20. and the others Jan. 19. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not report gold and silver in their reports.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to Jan. 11:

	1905.	1906.	Changes.
India	£ 192,600	£ 747,200	I. £ 554,600
China	.....	.....	.....
Straits	2,800	.....	D. 2,800
Total	£ 195,400	£747,200	I. £ 551,800

Receipts for the week were £3,000 from the West India; £355,000 bar silver and £119.000 in Mexican dollars from New York; £477,000 in all. Exports were £384,000 to India.

Indian exchange is firmer, and the Council bills offered in London were taken at an average of 16.8d. per rupee. The demand for silver on Indian account has been good, and shipments large.

Silver continues steady in price. Absorption of metal goes on as usual, with demand taking up the regular supply. Mexico is at times in the market, and has been disposed to work off some silver for purposes of increasing her gold reserves.

SILVER AND STERLING EXCHANGE.

Jan.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Jan.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
18	4.8695	65⅛	30 3/16	22	4.8725	65⅛	30⅛
19	4.8695	65⅛	30⅛	23	4.8710	65⅛	30⅛
20	4.8695	65⅛	30⅛	24	4.87	65⅛	30⅛

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Other Metals.

Daily Prices of Metals in New York.

January	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
18	18 @18⅛	18 @18¼	77⅛	36	5.60	6.55	6.3/8
19	18 @18¼	18 @18¼	77⅜	36¼	5.60	6.45	6¼ @6⅜
20	18 @18¼	18 @18¼	....	36⅛	5.60	6.45	6¼ @6⅜
22	18 @18¼	17⅞ @18⅛	78 5/16	36⅜	5.60	6.40	6.15
23	18 @18¼	17⅞ @18⅛	78 5/16	36¼	5.60	6 ⅜ @6.40	6.20 @6.25
24	18 @18¼	17⅞ @18⅛	78⅜	36½	5.60	6.⅜ @6.40	6.20 @6.25

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is usually 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting & Refining Co. for near-by shipments of desilverized lead in 50-ton lots, or larger orders. The quotations in spelter are for ordinary western brands; special brands command a premium.

Copper.—The week under review did not bring any change. The market was lifeless and characterized by a total absence of any buying movement. It closed dull at 18@18¼ for Lake; 17⅞@18⅛ for electrolytic in cakes, wirebars or ingots, and 17¾@17⅞ for casting copper.

The London standard market had quite a serious decline toward the end of last week, but rallied at the beginning of this week and closes firm at £78 15s. for spot and £77 for three months. Refined and manufactured sorts we quote: English tough, £83@£84; best selected, £84@85; strong sheets, £90.

Exports of copper from New York for the week were 2,734 long tons. Our special correspondent reports the exports from Baltimore at 1,480 long tons of fine copper.

Imports of copper and copper material into Great Britain, with exports, including re-exports of foreign material, are reported as below for the full year, in long tons; the totals giving the contents of all material in fine copper:

	1904.	1905.	Changes.
Copper ore	79,145	92,715	I. 13,570
Matte and precipitate	66,672	69,129	I. 2,457
Fine copper	89,288	70,171	D. 19,117
Total imp. copper	130,539	114,008	D. 16,531
Exports	49,210	52,551	I. 3,341
Re-exports	7,236	14,201	I. 6,965
Total exports	56,446	66,752	I. 10,306
Balance imp	74,093	47,256	D. 26,837

Imports from the United States, included above, were 188 tons ore, 5,057 tons matte and 48,395 tons fine copper in 1904; and 490 tons ore, 4,889 tons matte and 28,243 tons fine copper in 1905. There was an increase of 302 tons ore last year, but decreases of 168 tons matte and 20,152 tons fine copper.

Tin.—The volume of business, which was considerable the previous week, has somewhat diminished, but prices, on account of the small supplies available, have kept steady. The market is quoted from 36⅜@36⅝, depending on deliveries.

Owing to manipulation, the London market became quite weak, prices declining to £162 for spot and £162 7s. 6d. for three months. During this week, however, values have risen again and the market closes firm at £165 12s. 6d. for both spot and three months.

Imports and exports of tin in Great Britain for the full year are reported as follows, in long tons:

	1904.	1905.	Changes.
Straits	32,575	33,446	I. 871
Australia	4,156	4,074	D. 82
Other Countries	2,572	2,235	D. 337
Total Imports	39,303	39,755	I. 452
Re-exports, foreign	27,225	29,157	I. 1,932
Exports	5,864	7,619	I. 1,755
Total exports	33,089	36,776	I. 3,687
Balance	6,214	2,979	D. 3,235

The larger part of the re-exports is Straits tin sent to the United States.

Lead.—There was not any improvement noticeable in the market for this metal during the past week, and the demand still remains very slack. There were some sales of spot lead made during the week at 5.60c., New York.

The London market, however, has become somewhat steadier, and while toward the end of the week quotations were cabled at £16 8s. 9d. for Spanish lead, it closed at £17 1s. 3d. for English lead.

Imports and exports of lead in Great Britain for the full year are reported as follows, in long tons:

	1904.	1905.	Changes.
United States	36,748	24,688	D. 12,060
Spain	110,851	106,601	D. 4,250
Australia	73,967	70,504	D. 3,463
Germany	17,219	23,721	I. 6,502
Other Countries	7,723	4,027	D. 3,696
Total imports	246,508	229,541	D. 16,967
Exports	34,960	41,640	I. 6,680
Balance Imp	211,548	187,901	D. 23,647

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is weak and largely lower. The latest sales here are on a basis of 5.65c. for Missouri brands.

Spanish Lead Market.—Messrs. Barrington & Holt write from Cartagena, Spain, under date of Jan. 1, that silver has been 15 reales per ounce. Exchange has been 31.90 pesetas to £1. Local price for pig lead has been 93 reales per quintal; equal, on current exchange, to £16 6s. 1d. per long ton, f. o. b. Cartagena. Exports have been 1,290 tons argentiferous and 400 tons desilverized lead to London; 271 tons argentiferous and 168 tons desilverized to Marseilles; 101 tons desilverized lead to Genoa.

Spelter.—The selling pressure which was reported last week still continues, which tends to scare off prospective buyers. The market closed this week at 6⅜@6.40 New York and 6.20@6.25 St. Louis.

The London spelter market has shown a little more strength and closed at £28 2s. 6d.

Imports and exports of spelter in Great Britain for the full year are reported as follows, in long tons:

	1904.	1905.	Changes
Spelter	88,668	90,808	I. 2,140
Zinc sheets, etc.	22,412	21,166	D. 1,246
Total imports	111,080	111,974	I. 894
Exports	7,867	7,334	D. 533
Balance Imp	103,213	104,640	I. 1,427

Imports of zinc ores are not reported separately.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Spelter is dull and declining. The latest sales are on a basis of 6.35c. East St. Louis.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Jan. 1, that prices are nominally unchanged at 95 fr. for blende, 35% zinc, and 72 fr. for calamine, 30% zinc. There has been no change in conditions. Shipments have been 2,550 tons blende and 300 tons calamine, all to Antwerp.

Zinc Sheets.—The price of zinc sheet is now $8 per 100 lb. (less discount of 8%), f. o. b. cars Lasalle and Peru, in 600-lb. casks, for gauges No. 9 and 22, both inclusive, widths from 32 to 60 in., both inclusive, and lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c per 100 lb. The fluctuations in the base price for sheet zinc since January 1, 1905, have been as follows: December 30, 1904, $7.25; January 7, 1905, $7.50; May 12, $7.25; June 1, $7; July 29, $7.25; August 10, $7.50; December 1, $7.75; January 6, 1906, $8.

Antimony.—There is no change to be reported in the market and quotations.

Nickel.—Quotations for large lots, New York, or other parallel delivery, are 40@47c per lb., according to size and condition of order. For small quantities, prices range from 48 up to 60c., also according to size of order and deliveries.

Platinum.—Quotations are firm at $20.50 per oz. Gas-engine sparking points vary from 87c. for "A," to $1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated wire, 90c.; and cones, $1 per gram.

Quicksilver.—The metal is a little firmer and New York prices have advanced. They are now $41 per flask of 75 lb. for lots of 100 flasks or over, and $42 for small lots down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to $43.50@$44 per flask. San Francisco prices are firm at $39.50 for domestic orders and $38 for export. The London price has been advanced 2s. 6d., to £7 7s. 6d. per flask, and jobbers ask £7 10s. for moderate lots.

Imports of quicksilver into Great Britain for the full year, with re-exports of foreign metal were, in pounds:

	1904.	1905.	Changes.
Imports	2,491,442	2,552,586	I. 61,144
Re-exports	2,045,863	1,599,829	D. 446,034
Net Imports	445,579	952,757	I. 507,178

The larger part of the imports is from Spain, though some comes also from Austria.

Missouri Ore Market.

JOPLIN, Jan. 20.

The highest price paid for zinc was $54 per ton, the assay basis ranging from $50 down to $45 per ton of 60% zinc. The price is unchanged from the previous week. The average price this week is $46.54. The same week last year the highest price was $60 per ton.

While some lead was loaded the first of the week on last week's sales at as high as $80, the price declined at the end of the week to $76 per ton; $5 less than the high price a week ago. The average price for the week was $75.78. A year ago the high price was $62.

The shipment of the week is a decrease of 1,532,870 lb. of zinc and an increase of 520,980 lb. of lead, compared with the previous week. Compared with the same week a year ago it is an increase of 2,960,730 lb. of zinc, and 384,090 lb. of lead. In values last week exceeded the same week a year ago by $56,250, but was $20,520 less than the previous week. Three weeks of this year exceed the corresponding period of last year $265,355.

Following are the shipments for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Joplin	2,906,260	299,570	$82,500
Carterville-Webb City	2,297,520	647,490	79,740
Duenweg	1,035,770	183,930	31,830
Galena-Empire	1,066,980	162,340	30,180
Aurora	851,110	.....	15,770
Baxter Springs	306,540	132,400	12,240
Neck City	465,720	.....	11,640
Alba	393,640	39,830	11,350
Badger	399,770	.....	10,000
Prosperity	270,290	53,300	8,105
Granby	400,000	38,000	7,980
Carthage	311,070	.....	7,770
Oronogo	334,500	9,030	7,725
Spurgeon	201,500	3,840	3,990
Central City	123,340	.....	2,780
Zincite	97,99	1,040	2,390
Stott City	95,830	.....	2,390
Sherwood	75,260	16,060	2,129
Beef Branch	58,450	13,970	1,240
Totals	11,687,540	1,600,800	$331,680

Zinc value, the week, $271,015; 3 weeks, $756,870.
Lead value, the week, 60,665; 3 weeks, 153,235.

Same week last year	8,726,810	1,216,710	$275,430
Three weeks this year	32,779,080	4,910,640	910,105
Three weeks last year	22,619,110	2,690,480	644,750

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1904.	1905.	Month.	1904.	1905.
January	33.33	52.00	January	55.55	61 50
February	33.63	52.77	February	56.37	57.62
March	35.40	47.40	March	57.20	57.50
April	35.75	42.88	April	58.00	58.00
May	34.87	43.31	May	57.77	58.27
June	31.93	40.75	June	56.60	57.80
July	33.37	43.00	July	53.00	58.00
August	37.55	48.83	August	53.00	58.00
September	40.18	46.75	September	53 50	63.50
October	43.65	47.60	October	53.50	63.86
November	43.95	49.55	November	54.70	68.67
December	46.38	49.00	December	55.55	76.25

Wisconsin Ore Market.

PLATTEVILLE, Jan. 20.

The price paid for 60% zinc ore on an assay basis varied somewhat with the different buyers; the highest price reported, was $54. Empire ore, as usual, brought top price for the pyritic ores. A new buyer got it all this week, much to the surprise of the regular buyer. There are two representatives of smelters in the district who jump in and buy whenever the market goes down a little, thus tending to keep prices at a point that is quite satisfactory to the producer.

Lead is still scarce; that sold brought as high as $37.50 per thousand for the better grades.

The different camps in the Platteville district reported ore loaded as follows:

	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	408,470	87,000	.....
Mineral Point	230,400	.....	.....
Buncombe-Hazel Green	120,200	.....	.....
Benton	100,000	.....	.....
Linden	45,830	.....	.....
Shullsburg	43,320	.....	.....
Livingston	40,000	.....	.....
Cuba City	.....	56,000	.....
High'and	.....	30,000	.....
Montfort	.....	.....	653,000
Total	988,220	173,000	653,000

Rains and extremely mild weather made the roads bad. Traffic on one of the main ore-hauling roads was badly crippled on account of high water; consequently all the ore produced was not loaded.

Mining Stocks.

New York. Jan. 24.

The stock market, though still high, has been rather irregular, and at the close today some recessions from high points were noted.

Copper shares have not been quite so prominent, though still active. On the outside market United Copper closed at $64½; Utah at $37; Boston at $28½; Nevada Consolidated, $11½; all showing fractional losses. Amalgamated Copper was not affected by the declaration of the quarterly dividend at an unchanged 6% rate; later, however, it fell off with others, selling down to $111¾ at the close.

The industrials were affected to some degree also, showing small losses from the high points. American Smelting and Refining sold down to $171 for the common, and $128 for the preferred. United States Steel was quoted at $45½ for the common, and $112½ for the preferred. Tennessee Coal, Iron and Railroad closed at $158, a small loss.

On the Consolidated Exchange, there were small scales of the Comstocks. Of the Colorado stocks El Paso was quoted at 67c. The Tonopah shares were quite active, Jim Butler selling at 99c., and Diamondfield at 62c. There was one sale, at $4.50, of Standard Consolidated, of California.

Boston. Jan. 23.

The reaction in the New York market and the reduction in the price of copper has resulted in a lessened amount of speculation in copper shares, and a resultant reaction. This is considered healthy and ought to redound to their credit in the spring, which usually brings a good market in mining shares. The 1½% dividend declared by Amalgamated directors cannot be considered disappointing as it puts the stock back to its original 6% basis. Saturday it touched $115.-12½ per share but today it fell back to $109,75. The new United States Smelting, Refining and Mining shares were placed on the unlisted sheet Saturday, while the old stock has been stricken from the list. It is estimated that about 500,000 shares of United States Mining stock have been deposited for exchange. The new common started on the curb at $57.75 a week ago and since it has been listed it touched $66, reacting to $59. The range of the preferred has been from $44.50 to $47.75, with the close $45.50 tonight. The rights touched $3 but are off to $1.87½ now.

There was continued heavy selling of Bingham around $35, with no solution volunteered. Since, however, the price has declined to $33.75. Boston Consolidated, which rose $1.75 to $32.12½, last week, took a drop to $27.75 Monday, on rumors that the contemplated deal was off. On the announcement from President Newhouse that rich strikes made at the property had increased the original value, the stock recovered fractionally. Parrot spurted $4.50 to $44.50, but lost most of the gain and Copper Range rose $2.37½ to $86.37½, which is its record price, but fell back to $83.50. Isle Royale was conspicuous with a $3.50 advance to $28.50; it closed under this tonight. Allouez sold up $2.25 to $46, but did not hold it, and Utah Consolidated advanced to $68.25, subsequently reacting to $65.50. North Butte closes $1.50 below last week at $87.50. Centennial is off $1.75 to $29.25, Osceola $2.50 to $102.50, and Wolverine $2.50 to $87.

The St. Mary's Mineral Land Co. has issued 10,000 additional shares at $50 per share to holders of record Jan. 24, in the proportion of one new share for 15 held, to pay for development work at the King Philip and Challenge locations. The stock sold at $82@80 on the curb and the rights around $2.

Business on the curb continues in large volume with no special features.

Colorado Springs. Jan. 20.

The local mining market has been comparatively quiet, and most of the stocks have remained at about the quotations of one week ago. The volume of trading has also been light. There have been no developments of any importance in the camp since last report. J. A. Hayes, president of the First National Bank of this city, was elected president of the Jack Pot Gold Mining Co. at their annual meeting.

Portland is selling at $1.95; El Paso at 67¾c.; Findley at 88⅛; Isabella at 24; Independence at 18c.; Vindicator has declined from $1.00 to 92c.; Dante from 7⅜ to 6⅝c. per share.

San Francisco. Jan. 18.

A little activity, with a sharp rise, in the Comstocks was followed by dullness,

though prices were held up pretty well. Ophir sold at $6; Consolidated California & Virginia, $1.30; Mexican, $1.25; Best & Belcher, $1.15.

The Tonopahs were active, with heavy buying. Later in the week there were some declines, due chiefly to profit taking, but prices soon recovered. Tonopah, of Nevada, sold at $19.25; Tonopah Belmont, $2.80; Red Top, $2; Tonopah Midway, $1.85; Golden Anchor, $1.50; Jim Butler, 90c. per share.

Oil stocks have been dull. Caribou sold at $7; Four Oil, 35c. at the close.

Assessments.

Company.	Delinq.	Sale.	Amt.
Alta Sierra	.....	Jan. 31	$0.20
Alpha Con.	Jan. 31	Feb. 21	0.05
Apollo Con.	Feb. 19	.....	0.10
Belcher	Feb. 14	Mar. 7	0.10
Best & Belcher	Feb. 9	Feb. 28	0.10
Brunswick-Chollar	Dec. 30	Jan. 22	0.03
Brunswick-G. & Curry	Jan. 12	Jan. 31	0.03
Bullion	Jan. 11	Feb. 1	0.05
Caledonia	Feb. 16	Mar. 9	0.10
Con. Cal & Virginia	Feb. 13	Mar. 6	0.25
Con. Imperial	Feb. 14	Mar. 13	0.01
Exchequer	Feb. 14	Mar. 7	0.05
Fair View, Cal.	Feb. 12	.....	0.10
Grape Vine Can.	.....	.....	0.02½
Lady Washington	Jan. 20	Feb. 10	0.05
Last Chance, Cal.	.....	Jan. 27	0.005
Julia Con.	Jan. 6	Jan. 29	0.03
Mexican	Feb. 7	Feb. 28	0.15
Mt. Pleasant Con.	Jan. 29	Feb. 12	0.03
Providence, Utah	Feb. 5	Mar. 12	0.00½
Potosi	Feb. 5	Feb. 27	0.10
Overman	Jan. 3	Jan. 22	0.10
San Juan Grande	Feb. 5	.....	0.045
Sierra Nevada	Jan. 22	Feb. 12	0.10
Sonora Quartz Div	Feb. 2	.....	0.02
Union Con.	Jan. 25	Feb. 15	0.10
Utah Con., Nev.	Jan. 15	Feb. 6	0.05
Silver Shield, Utah	Jan. 13	Jan. 29	0.03
Vespasian-Hoogley	Feb. 12	Feb. 28	0.012

Dividends.

Company.	Payable.	Rate.	Amt.
Alaska Mexican	Jan. 29	$0.30	$54,000
Alaska Treadwell	Jan. 29	1.00	200,000
Amalgamated Copper	Feb. 26	1.50	2,296,319
Bethlehem Steel Corp., pfd.	Feb. 1	1.75	262,500
Boston & Montana	Jan. 18	12.00	1,800,000
Cambria Steel		0.75	1,350,000
Grand Central, Utah	Jan. 15	0.05	12,500
Homestake	Jan. 25	0.50	109,200
Int. Steam Pump, pfd.	Feb. 1	1.50	132,750
International Nickel, pfd.	Feb. 1	1.50	133,689
Mountain View, Utah	Jan. 15	0.02½	3,488
Monongahela Con. Coal, pfd		0.97	194,000
Nat. Steel & Wire	Jan. 31	1.75	52,390
Osceola Copper	Jan. 31	4.00	400,000
Quincy Copper	Feb. 26	5.00	500,000
Tamarack Copper	Jan. 25	3.00	300,000
Tonopah of Nev.	Jan. 22	0.25	250,000
Tenn. Coal, Iron & R. R.	Feb. 1	1.00	225,531
Tenn. Coal, Iron & R.R., pfd.	Feb. 1	2.00	4,966
Victoria, Utah	Jan. 15	0.03	7,500
Vindicator Con.	Jan. 25	0.03	

*Monthly. §Bi-monthly. †Quarterly. ‡Semi-Annually.

St. Louis.

Jan. 20.

	High.	Low.
Adams	$ .40	$ .25
American Nettie	.17	.15
Center Creek	3.00	2.25
Central Coal & Coke	62.00	60.00
" " " pfd.	80.00	79.00
Central Oil	60.00	55.00
Columbia	1.90	.50
Con. Coal	30.00	28.00
Doe Run	200.00	115.00
Granite Bimetallic	.22	.20
St. Joe	30.00	25.50

LONDON. (*By Cable.**) Jan. 24.

	£	s.	d.
Dolores	2	0	6
Stratton's Independence	0	8	0
Camp Bird	1	11	6
Esperanza	5	6	3
Tomboy	1	6	3
El Oro	1	7	6
Oroville	0	19	6
Arizona Copper	3	2	0
Arizona Copper, pf.	3	1	9

*Furnished by C. Schumacher & Co., New York.

STOCK QUOTATIONS.

NEW YORK. Week Jan. 24

Name of Company.	High	Low	Clg.	Sales
Amalgamated	114⅞	110	110⅜	1,019,810
Anaconda	295	250	272¾	319,500
British Col. Copper	9⅝	9	9	5,135
Federal	199	145	180	6,000
Federal, Pf.	112⅞	105⅞	110	49,600
Greene Copper	29¾	27⅞	29	13,700
Greene Gold	3⅞	3½	3⅞	2,000
Mitchell	14¼	13¼	13½	12,700
Ontario				
Tennessee Copper	49¾	47¾	48	3,750
Union Copper	2 1/16	1 15/16	2	7,725
United Copper,	65⅛	63¼	63¾	76,540
United Copper, Pref.	96	91	95¼	1,310
Utah Apex	8⅝	7⅜	7⅞	9,500
Utah Copper	38¼	32¼	33⅜	9,820

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.	174	168¾	170¼	284,800
Am. Smelting & Ref., Pf.	130	127⅝	128¾	22,300
Col. Fuel & Iron	80	70½	80	354,930
National Lead	95⅜	88⅛	90	110,509
Pittsburg Coal	17½	15⅛	16⅝	5,500
Pittsburg Coal, pf.	62½	60	61	2,200
Republic I. & S.	37⅝	35⅝	36⅜	18,400
Republic I. & S., Pf	108½	107	107½	9,300
Tenn. C. & I.	163	158	159	11,600
U. S. Red. & Ref.	30⅞	30	30	950
U. S. Red. & Ref., Pf.	69	68	68	1,250
U. S. Steel	46¼	44½	45¾	344,020
U. S. Steel, Pf	113¾	109¾	112¾	224,146
Standard Oil	692	677	688	786
Bethlehem Steel	35	31	34	11,100

BOSTON.

Allouez	45¾	43	43¾	7,125
Amalgamated	115⅛	109¼	110⅛	79,087
Atlantic	26¾	25½	26	2,020
Bingham	35	33¾	34¼	13,750
Boston Consolidated	32¼	27¾	28⅛	26,275
*Calumet & Hecla	710	700	710	43
†Centennial	31	29¼	29¾	3,067
Mercur	70	64	65	2,700
*Copper Range	86¾	83	84	22,113
Daly-West	18	16½	16¾	1,807
Franklin	18⅜	17	18	3,092
Granby	10¼	9⅜	10¼	9,090
Green Con. Copper	30	29	29½	27,086
Isle Royale	28½	25	27½	7,755
†Mass	11⅞	10⅞	11	1,045
Michigan	17	16¼	16½	1,725
Mohawk	60¼	58¾	59⅛	1,503
*North Butte	90⅛	85½	87⅛	13,563
*Old Dominion	41½	39¼	39⅞	6,965
Osceola	104½	102½	104	1,856
*Parrot	44⅝	39	41	12,623
Quincy	112	110	110	791
Rhode Island	8¾	7⅛	7¼	10,032
Shannon	7	6¼	6⅞	3,221
Tamarack	110	107	107	86
Tecumseh	14⅜	13⅛	14¾	1,745
United Copper, com.	65⅞	63⅛	64	9,361
U. S. Mining	55	52	53	19,677
Utah	68½	64½	66	40,434
Wolverine	134¾	132	132	265

PHILADELPHIA.

Cambria Steel	36⅝	34⅛	36⅝	90,845
Philadelphia Co.	53⅞	53	53⅛	11,494
Tonopah	19¾	18⅛	19	5,065

PITTSBURG.

Crucible Steel	17½	15	17	17,420
Crucible Steel, Pref.	80½	78¼	80½	13,535
Tonopah Ext.	7.95	7.40	7.40	8,225

COLORADO SPRINGS.

Name of Company.	First	High	Low	Clg.
Elkton	46½	46¾	45	45
El Paso	66	79½	66	79½
Isabella	24½	24½	24	24½
Portland.	193	193	175	175
Vindicator	90	92	84	84

SAN FRANCISCO.

Best & Belcher	1.15	1.20	1.15	1.15
Bullion	.25	.25	.20	.20
Caledonia	.50	.50	.43	.43
Confidence	.79	.79	.72	.72
Con. Cal. & Va.	1.30	1.30	1.20	1.20
Gould & Curry	.19	.19	.18	.18
Hale & Norcross	.99	.99	.88	.89
Mexican	1.30	1.30	1.20	1.20
Occidental Con	.92	.92	.92	.92
Ophir	6.37½	6.37½	5.87½	5.87½
Savage	.46	.46	.40	.44

*Ex-dividend. †1st Installment Paid
Assessment Paid. §2d Installment Paid

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	57.005	60.690	26.423	27.980
February	57.592	61.023	26.665	28.047
March	56.741	58.046	26.164	26.794
April	54.202	56.600	24.974	26.108
May	55.430	57.832	25.578	26.664
June	55.673	58.428	25.644	26.910
July	58.095	58.915	26.760	27.163
August	57.806	60.259	26.591	27.822
September	57.120	61.695	26.349	28.528
October	57.923	62.034	26.760	28.637
November	58.453	63.849	26.952	29.493
December	60.563	64.850	27.930	29.977
Year	57.221	60.352	26.399	27.839

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1904.	1905.	1904.	1905.	1904.	1905.
Jan.	12.410	15.008	12.553	15.128	57.500	68.262
Feb.	12.063	15.011	12.245	15.136	56.500	67.963
March	12.299	15.125	12.551	15.250	57.321	68.174
April	12.923	14.920	13.120	15.045	58.247	67.017
May	12.758	14.627	13.000	14.820	57.321	64.875
June	12.269	14.673	12.399	14.813	56.398	65.881
July	12.380	14.888	12.505	15.005	57.256	66.887
Aug.	12.343	15.664	12.468	15.795	56.952	69.830
Sept.	12.495	15.965	12.620	15.978	57.645	69.667
Oct.	12.993	16.279	13.118	16.332	60.012	71.406
Nov.	14.284	16.599	14.456	16.758	65.085	74.727
Dec.	14.661	18.328	14.849	18.398	66.384	78.993
Year.	12.823	15.590	12.990	15.699	58.587	69,465

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.	28.845	29.325	July	26.573	31.760
Feb.	28.087	29.262	August	27.012	32.866
March	28.317	29.523	Sept	27.780	32.095
April	28.132	30.525	Oct	28.596	32.481
May	27.718	30.049	Nov.	29.185	33.443
June	26.325	30.329	Dec.	29.286	35.835
			Av. year.	27.986	31.358

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.	4.347	4.552	July	4.192	4.524
Feb.	4.375	4.450	Aug.	4.111	4.665
March	4.475	4.470	Sept.	4.200	4.850
April	4.475	4.500	Oct.	4.200	4.850
May.	4.423	4.500	Nov.	4.200	5.200
June	4.496	4.500	Dec.	4.600	5.422
			Av., year.	4.309	4.707

Prices are in cents per pound.

SPELTER.

Month.	New York.		St. Louis.		L'nd'n
	1904.	1905.	1904.	1905.	1905.
January	4.863	6.190	4.673	6.032	25.063
February	4.916	6.139	4.717	5.989	24.594
March	5.057	6.067	4.841	5.917	23.825
April	5.219	5.817	5.038	5.667	23.813
May	5.031	5.434	4.853	5.284	23.594
June	4.760	5.190	4.596	5.040	23.875
July	4.873	5.396	4.723	5.247	23.938
August	4.866	5.706	4.716	5.556	24.675
September	5.046	5.887	4.896	5.737	26.375
October	5.181	6.087	5.033	5.934	28.225
November	5.513	6.145	5.363	5.984	28.500
December	5.872	6.522	5.720	6.374	28.719
Year	5.100	5.882	4.931	5.730	25.433

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.